PROSJEKTRAPPORT

ISSN 0071-5638

Distribusjon:
ÅPEN

HI-prosjektnr.:
91.02.1

Oppdragsgiver(e):

Oppdragsgivers referanse:

HAVFORSKNINGSINSTITUTTET
MILJØ - RESSURS - HAVBRUK

Nordnesparken 2 Postboks 1870 5024 Bergen
Tlf.: 55 23 85 00 Faks: 55 23 85 31

Forskningsstasjonen	Austevoll	Matre
Flødevigen	Havbruksstasjon	Havbruksstasjon
4817 His	5392 Storebø	5198 Matredal
Tlf.: 37 05 90 00	Tlf.: 56 18 03 42	Tlf.: 56 36 60 40
Faks: 37 05 90 01	Faks: 56 18 03 98	Faks: 56 36 61 43

Rapport:
FISKEN OG HAVET NR. 4 - 1998

Tittel:
ACOUSTIC INVESTIGATIONS OF SIZE AND DISTRIBUTION OF THE BARENTS SEA CAPELIN STOCK 1972-1997

Senter:
Marine ressurser

Seksjon:
Pelagisk

Forfatter(e):
Harald Gjøsæter, Are Dommasnes
og Bente Røttingen

Antall sider, vedlegg inkl.:
71

Dato:
30.03.98

Sammendrag:

Estimates of stock size and geographical distribution of the Barents Sea capelin stock, obtained by acoustic methods, are reviewed in the period 1972 to 1997.

Rapporten oppsummerer resultata av dei akustiske undersøkingane på lodde i Barentshavet i perioden 1972-1997.

Emneord - norsk:
1. Akustisk metode
2. Barentshavet
3. Lodde, *Mallotus villosus*

Emneord - engelsk:
1. Acoustic methods
2. Barents Sea
3. Capelin, *Mallotus villosus*

Harald Gjøsæter
Prosjektleder

Svein A. Iversen
Seksjonsleder

Acoustic Investigations of Size and Distribution of the Barents Sea Capelin Stock 1972-1997

by

H. Gjøsæter, A. Dommasnes and B. Røttingen

SUMMARY

The abundance and geographical distribution of the Barents Sea capelin stock have been monitored using acoustic methods since 1972. Today, 26 years later, it is one of the few stocks, within the ICES area, for which an annual acoustic stock size estimate serves as the only basis for stock assessment and management. The results from the annual surveys are given in anonymous cruise reports. The methods have changed and a large development has taken place in the technical equipment since the early 1970s. The time series of acoustic estimates from the annual autumn surveys, as well as the development of methods in the period 1972-1984, were reviewed in a report to the second Norwegian-Russian symposium in Bergen 1984 (Dommasnes and Røttingen 1985). Since then, another 13 years have been added to the time series and the development of methods has continued. Some amendments and corrections have been made to the software used for calculation of stock abundance and, in the present review, all stock size estimates have been recalculated. Therefore, the estimates presented here deviate somewhat from those presented earlier.

In an article titled "Acoustic stock measurements of the Barents Sea capelin 1972-1997 – A review" in the journal Sarsia, a comprehensive review of these data is presented (Gjøsæter *et al.* 1998). Figures and tables showing details of geographical distribution and stock size estimation each year were meant to accompany that article. However, the large amount of figures and tables could not be included there, and therefore we have chosen to present this material in Fisken og Havet, to supplement the article in Sarsia. Some of the text from that article is reproduced here, some of it, for example the sections dealing with accuracy and precision of the estimates, are left out. Please refer to the article in Sarsia for a more complete discussion of these topics.

NORSK SAMANDRAG

Sidan 1972 er mengde og utbreiing av lodde i Barentshavet blitt overvaka ved hjelp av akustikk. I dag er dette en av dei få bestandane innanfor ICES-området som vert overvaka og forvalta utelukkande på grunnlag av eit årleg, akustisk, bestandsmål. Resultata frå det årlege akustiske toktet vert presenterte i anonyme og upubliserte toktrapportar. Metodane har endra seg, og det tekniske utstyret er gradvis vorte forbetra. Eit oversyn over utviklinga i perioden 1972 til 1984 vart presentert på det norsk-russiske loddesymposiet i Bergen i 1984 (Dommasnes og Røttingen 1985). Sidan er nye 13 år lagt til tidsserien, metodeutviklinga har halde fram, og tida er no inne til å presentere heile denne akustiske tidsserien. Programma bruka til å rekna ut mengda fisk er retta og forbetra på ein del punkt opp gjennom åra. Bestandsestimata attgjevne i denne artikkelen er difor rekna ut på nytt, og skil seg noko frå dei estimata som tidlegare er presenterte.

I ein artikkel i tidsskriftet Sarsia kalla "Acoustic stock measurements of the Barents Sea capelin 1972-1997 – A review" (Gjøsæter *et al.* 1998) presenterer vi ein grundig gjennomgang av denne tidsserien. Detaljerte figurar og tabellar som viser utbreiing og mengde av lodde kvart år var meint å inngå der, men materialet vart for omfangsrikt. Vi har difor valt å presentere dette materialet her. For heilskapen si skuld har vi også teke med ein del av teksten i den omtala artikkelen i Sarsia, men t.d. diskusjonen om godleiken av estimata har vi ikkje teke med her. Lesarane som har interesse av dette stoffet vert bedne om å lesa artikkelen i Sarsia.

MATERIAL AND METHODS

Acoustic stock size estimation procedure

A full discussion of the acoustic methods, including descriptions of acoustic instruments and their calibration, can be found in textbooks on the subject, *e.g.* MacLennan and Simmonds (1992). The basic relationship between the echo density, or area backscattering coefficient s_A (the output from the echo integrators), and the area density (number of fish per unit area) ρ_A is:

$$s_A = \overline{\sigma} \cdot \rho_A \qquad (1)$$

where the proportionality factor $\overline{\sigma}$ is called the mean acoustic cross section (MacLennan and Simmonds 1992) and is a measure of the fish's ability to reflect sound. When the mean echo density in a unit area and the sound reflection characteristics of the fish targets are known, the number of fish, N, can be found:

$$N = \rho_A \cdot A = \frac{s_A}{\overline{\sigma}} \cdot A \qquad (2)$$

If the mean weight $\overline{w}$ of these fishes is known, the biomass, B, can be calculated:

$$B = N \cdot \overline{w} \qquad (3)$$

The acoustic cross section of a fish (the logarithmic form is called target strength, TS, where $TS = 10\log\frac{\sigma}{4\pi}$) is length dependent. The relationship between target strength and fish length is empirically established for each species. When the acoustic method was first applied on capelin in the early 1970s, no target strength measurements were available for this species. A conversion factor between integrator output and number of fish was established by counting fish traces on the echograms (Midttun and Nakken 1971). This gave rise to quite varying conversion factors during the early 1970s (Dommasnes and Røttingen 1985). A part of this variation was probably due to variations in the performance of the acoustic systems. Gradually, estimates of capelin target strength and its dependence on length became available (Dommasnes and Røttingen 1985), and estimates obtained in previous years were recalculated accordingly. Since 1985, a TS-length relation of $TS = 19.1\log L - 74.0$ (where L is total length

of capelin in cm) has been used for capelin in the Barents Sea, corresponding to $\sigma = 5.00 \cdot 10^{-7} \cdot L^{1.91}$. All estimates presented in this paper are based on this target strength value. The evolution of the method of acoustic stock size estimation and in particular its application on the Barents Sea capelin stock was thoroughly described by Dommasnes and Røttingen (1985). They also recapitulated the history of conversion factors applied for the capelin in the period 1972 to 1984.

Since the target strength is length dependent, the conversion from s_A to number of fish has to be based on an observed length distribution of capelin. In practical work, mean s_A values along the cruise tracks are averaged over rectangular blocks with known area. Normally, blocks of two degrees of longitude by one degree of latitude (basic acoustic block) are used in the Barents Sea capelin surveys. For each of these blocks, a length distribution of capelin is constructed, based on representative trawl samples within each block.

The total number of fish in each block is then obtained by using equation 2. To divide the total number on age groups, an age/length key is used and biomass is calculated using weight/length keys. These keys are not based on the basic acoustic blocks, but represent aggregates of blocks with nearly identical length-at-age and weight-at-length which are combined to form subareas (typically 3-5 subareas are used). Separate keys are constructed for each of these subareas.

Historical aspects of the acoustic surveys

An acoustic survey of the Barents Sea capelin stock was carried out with the new Norwegian research vessel "G.O. Sars" in August-September 1971 (Dragesund and Nakken, 1972). Attempts to calculate the stock size of capelin from acoustic data, collected during this cruise, were so promising that another acoustic survey was carried out in August-September 1972 (Gjøsæter *et al.* 1972), this time with the two research vessels "G.O. Sars" and "Johan Hjort" working together. Since then, systematic acoustic surveys of the Barents Sea capelin stock have been carried out annually in September-October by personnel and research vessels from the Institute of Marine Research in Bergen (IMR). A summary of the surveys is given in Table 1.

A Russian research vessel participated in the survey for the first time in 1975 (Table 1). Since then, the surveys have been carried out as co-operative projects between IMR and

the Polar Research Institute of Marine Fisheries and Oceanography in Murmansk (PINRO). As practical procedures for co-operation and data handling gradually improved, the Russian participation allowed a better coverage of the area of distribution of the capelin stock.

The echosounders on board each vessel were always calibrated according to standard methods (MacLennan and Simmonds 1992) before the surveys. In addition, inter-ship comparisons were performed during the surveys, to ensure that the acoustic equipment on board the different vessels gave similar results under working conditions.

Description of sampling design

Acoustic sampling

The cruise tracks are laid out in order to cover the main distribution area of capelin by regularly spaced east-west transects, normally with 30 nautical miles between each transect. Since each acoustic block is 2° longitude by 1° latitude, the number of miles inside each block will vary with latitude, from about 40 in the northern part to 80 in the southern part of the Barents Sea. From four to six vessels normally take part in the survey (When the survey was carried out by the Institute of Marine Research alone, only two vessels participated). The total area is partitioned among the vessels so that they start working together in the centre of the area and spread out towards east and west. This is done to achieve maximum synoptical coverage of the main area, in order to minimise the effects of capelin migration. The integrated echo abundance (area backscattering coefficient - s_A) along the cruise tracks, is averaged over consecutive five nautical miles. All such five-mile values inside each basic acoustic block are averaged to give a mean s_A for the block.

Biological sampling

To convert the echo density to number of fish, to apportion the number on age groups, and to estimate the biomass of each species, biological samples are needed. Such samples are taken at irregular intervals along the cruise tracks, using pelagic trawl. The echosounders are watched continuously, and a trawl haul is taken whenever the characteristics of the echograms change (to check if changes in species or length distribution have taken place) or at regular intervals even if the echograms look the same (to check for changes in the biological characteristics of the fish).

A standard capelin sample consists of 100 individuals (Gjøsæter 1985), where length (total length, cm), weight (g), sex, age and other characteristics are recorded for each individual. Such samples are taken from most catches. In addition to this type of sample, length distributions are recorded for all additional catches.

RESULTS

The results of the abundance estimation are presented in Figures 1-26 for the years 1972-1997. The abundance estimate from 1971 has not been reconstructed, because the methods applied at that first survey were somewhat *ad hoc* and neither the method nor the basic data used were well documented.

The number-at-age of each year class 1971 to 1995 is shown in Figure 27, and charts summarising the time series of abundance estimates by number and biomass for the two years old and older capelin are shown in Figures 28 and 29 respectively.

The distribution of capelin is known to change with the hydrographic conditions of the Barents Sea (Ozhigin and Luka 1985). By comparing the distribution charts it is seen that the total distribution area in autumn may change substantially from year to year. In 1972-76 the capelin were distributed in the north-eastern part of the Barents Sea, and practically no capelin were found south of 74° N or west of Hopen island (Figs. 1-5). From 1977 the distribution area shifted south-westward to reach a maximum southern and western distribution in 1982 (Figs. 6-11). In 1983-1985 the northern boundary shifted northwards, but there were capelin both in the western and eastern areas north of 74° N (Figs. 12-14). During the stock collapse in 1986-89 the total distribution area was somewhat smaller and located centrally in the Barents Sea (Figs. 15-18). During 1990-92, the recovered stock was distributed over a wide area, extending almost as far north and east as it did during the period 1973-76 (Figs. 19-21). During the next stock collapse in 1993-1996 the distribution area shrunk and was again located centrally in the Barents Sea (Figs. 22-25), while the first signs of an increased distribution area, probably due to the new increase in stock size, is seen in 1997 (Fig. 26).

The abundance of capelin has changed considerably during the period 1972-97. Since the 1-year-olds were not properly covered before 1980, this age group is not presented in the time series charts in Figures 28 and 29. From 1972 to 1984, the stock was relatively stable, the average number of individuals and biomass were 400 billions and 4 million tonnes

respectively. From 1986 to 1989 and from 1994 to 1996, these figures declined to 25 billions and 0.3 million tonnes, respectively. The declines of stock size occurred very abruptly, but so did the recovery. For example, the average stock size in 1990 to 1992 was 380 billion individuals and 4.3 million tonnes.

The differences between the present estimates and those presented before are generally small and are mainly of two types. First, an error in the program used prior to 1978 when the lower limit in each ½ cm length group was used as basis for the calculations in stead of the midpoint, caused an overestimation in the order of 2-3 %. Second, by inspecting the length distributions of the first age group in the estimates and comparing it to length distribution of 0-group capelin, it was found that part if the 0-group must have been included in the 1-group estimates in some of the years. Furthermore, some small corrections have been made, *e.g.* where one or more blocks containing capelin were accidentally left out in some of the estimates. The maximum difference between the present estimates and those originally presented was 6% in number (1973), but after 1980 the differences were generally negligible.

The estimate obtained in 1982 presents a special problem. When that estimate was compared to those obtained in 1981 and in 1983, it was evident that the 1982 estimate was too high and at variance with the others (ICES 1984). Investigations revealed that the most probable reason for the severe overestimation in 1982 was that, while the calculations were based on the premise that a nickel transducer was used on one of the vessels, a ceramic transducer with quite a different sensitivity may accidentally have been used during parts of or the whole survey. This did not affect the 1-group estimate to any noticeable degree, because that age group was not found in the area covered by that vessel. Since it was not possible to determine exactly what had happened, it was decided to disregard the 1982 estimate for age groups 2-5, and replace it by estimated values calculated from previous and later estimates, obtained of the same year classes. These calculations were made using the model "capelin" (Tjelmeland 1985). The 1-group estimate is, however, the original obtained in 1982.

DISCUSSION

The acoustic method of fish abundance estimation by echo integration (Dragesund and Olsen (1965) has become one of the most important fishery independent tools in stock assessment for species which are conveniently located, *i.e.* not too close to the surface or the bottom (MacLennan and Simmonds (1992). The capelin is one of the species which lends itself especially suitable for acoustic abundance estimation, and the time series of abundance estimates of the Barents Sea capelin stock is almost as long as the history of the echo integration technique itself. However, in comparative terms, the results that could be obtained in the early days were subject to large errors. The calibration methods were imprecise, and the acoustic characteristics of the species were uncertain. Also, a tremendous development has taken place in the technical equipment since the early 1970s. High-performance scientific echosounders have now been introduced with larger dynamic range, more stable gain characteristics and better compensation for propagation losses. From 1989 the digital echo sounder Simrad EK 500 (Bodholt *et al.* 1988) and a combined echo integrator and echo sounder post processing system BEI (Foote *et al.* 1991) were introduced on the Norwegian vessels. In recent years this equipment, which has several advantages over earlier equipment, has also been installed on the Russian vessels participating in this survey. Better knowledge of fish behaviour and distribution has also aided the development towards more accurate stock size estimates of the Barents Sea capelin.

For these reasons, the quality of the estimates has no doubt improved over the years, but how much is difficult to assess. It is not even known how accurate they are today. The Northern Pelagic and Blue Whiting Fisheries Working Group, which deals with the assessment of this stock within ICES, has adopted the stock abundance estimates based on the annual acoustic survey as the sole basis for stock assessment and management purposes. However, on several occasions the group has noted that the estimates, especially of the youngest age group, are uncertain.

LITERATURE

Anon. 1980. Report on the Norwegian/USSR acoustic survey of the Barents Sea capelin stock in September/October 1980. 8 pp. [Mimeo]

Anon. 1981. Report on the Norwegian/USSR acoustic survey of the Barents Sea capelin stock in September/October 1981. 19 pp. [Mimeo]

Anon. 1982. Report on the Norwegian/USSR acoustic survey of the Barents Sea capelin stock in September/October 1982. 11 pp. [Mimeo]

Anon. 1983. Report on the Norwegian/USSR acoustic survey of the Barents Sea capelin stock in September 1983. 12 pp. [Mimeo]

Anon. 1984. Report on the Norwegian/USSR acoustic survey of the Barents Sea capelin stock in September 1984. 12 pp. [Mimeo]

Anon. 1985. Report on the joint Norwegian/USSR acoustic survey of capelin and herring in the Barents Sea in September - October 1985. 19 pp. [Mimeo]

Anon. 1986. Report on the joint Norwegian/USSR acoustic survey of capelin, herring, and polar cod in the Barents Sea in September - October 1986. 19 pp. [Mimeo]

Anon. 1987. Preliminary report on the joint Norwegian/USSR acoustic survey of capelin, herring, and polar cod in the Barents Sea in Sept. - Oct. 1987. 21 pp. [Mimeo]

Anon. 1988. Report on the joint Norwegian/USSR acoustic survey of pelagic fish in the Barents Sea September - October 1988. 19 pp. [Mimeo]

Anon. 1989. Report on the joint Norwegian/USSR acoustic survey of pelagic fish in the Barents Sea September - October 1989. 20 pp. [Mimeo]

Anon. 1990. Survey report from the joint Norwegian/USSR acoustic survey of pelagic fish in the Barents Sea September - October 1990. 24 pp. [Mimeo]

Anon. 1991. Survey report from the joint Norwegian/USSR acoustic survey of pelagic fish in the Barents Sea September - October 1991. 23 pp. [Mimeo]

Anon. 1992. Survey report from the joint Norwegian/Russian acoustic survey of pelagic fish in the Barents Sea September - October 1992. 24 pp. [Mimeo]

Anon. 1993. Survey report from the joint Norwegian/Russian acoustic survey of pelagic fish in the Barents Sea September - October 1993. 25 pp. [Mimeo]

Anon. 1994. Survey report from the joint Norwegian/Russian acoustic survey of pelagic fish in the Barents Sea September - October 1994. 25 pp. [Mimeo]

Anon. 1995. Survey report from the joint Norwegian/Russian acoustic survey of pelagic fish in the Barents Sea September 1995. 27 pp. [Mimeo]

Anon. 1996. Survey report from the joint Norwegian/Russian acoustic survey of pelagic fish in the Barents Sea September 1996. 25 pp. [Mimeo]

Anon. 1997. Survey report from the joint Norwegian/Russian acoustic survey of pelagic fish in the Barents Sea September 1997. 25 pp. [Mimeo]

Bodholt, H., H. Nes and H. Solli 1988. A new echo sounder system for fish abundance estimation and fishery research. ICES, C.M. 1988/B:11.

Buzeta, R. J. Dalen, A. Dommasnes, J. Hamre and O. Nakken 1975. Loddeundersøkelser i Barentshavet i september - oktober 1974. –Fiskets Gang, 61: 101-104. [In Norwegian]

Dommasnes, A. H. Loeng and T. Monstad 1979. Loddeundersøkelser i Barentshavet høsten 1978. –Fisken og Havet, 79(1):17-30. [In Norwegian]

Dommasnes, A. O. Nakken and I. Røttingen, 1976. Loddeundersøkelser i Barentshavet i september - oktober 1975. –Fiskets Gang, 62: 101-108. [In Norwegian]

Dommasnes, A. O. Nakken R. Sætre and Ø. Frøiland 1974. Lodde- og polartorskundersøkelser i Barentshavet i september-oktober 1973. –Fiskets Gang 60: 73-77. [In Norwegian]

Dommasnes, A. and I. Røttingen, 1977. Loddeundersøkelser i Barentshavet i september - oktober 1976. –Fisken og Havet, 77(2):47-59.

Dommasnes, A. and I. Røttingen, 1985. Acoustic stock measurements of the Barents Sea capelin 1972 - 1984. A review. In H. Gjøsæter (ed.): –The Proceedings of the Soviet-

Norwegian Symposium on the Barents Sea Capelin. Bergen, Norway, 14-17 August 1984. pp. 45-108, 18 tabs., 24 figs., 2 appendices.

Dragesund, O. and O. Nakken, 1972. Lodde- og polartorskundersøkelser i Barentshavet i August-September 1971. –Fiskets Gang, 58: 145-148. [In Norwegian]

Dragesund, O. and S. Olsen 1965. On the possibility of estimating year-class strength by measuring echo-abundance of 0-group fish. Fisk.Dir. Skr. ser. Havunders. 13(8):48-65.

Foote, K.G., H.P. Knudsen, R.J. Korneliussen, P.E. Nordbø and K. Røang 1991. Postprocessing system for echo sounder data. –The Journal of the Acoustical Society of America, vol. 90, No. 1:37-47.

Gjøsæter, H. 1985. Standard sampling procedure for Barents Sea capelin. A description of standard sampling technique and methods applied to improve the representativeness of the samples. –Pp. 119-133 in: Gjøsæter, H. (ed.): The proceedings of the Soviet-Norwegian symposium on the Barents Sea capelin. Institute of Marine Research, Bergen, Norway, 1985.

Gjøsæter, H., A. Dommasnes and B. Røttingen 1998. Acoustic stock measurements of the Barents Sea capelin 1972-1997 – A review. Sarsia, Vol x, xxx-xxx (In press).

Gjøsæter, J. L. Midttun, T. Monstad O. Nakken O.M. Smedstad R. Sætre and Ø. Ulltang, 1972. Undersøkelser av fiskeforekomster i Barentshavet og ved Spitsbergen i august-september 1972. –Fiskets Gang, 51: 1010-1021. [In Norwegian]

ICES 1984. Atlanto-scandian herring and capelin Working Group Report. ICES Headquarters 25-28 October 1983. ICES C.M. 1984/Assess:4. 31 pp.

MacLennan, D.N. and E.J. Simmonds 1992. Fisheries Acoustics. –Fish and Fisheries Series 5. Chapman and Hall, London. 325 pp.

Mamylov, V. and A. Dommasnes 1979. Report. Norwegian/USSR acoustic survey of the Barents Sea capelin stock in September 1979. Acoustic estimate. 4 pp. [Mimeo]

Midttun, L. and O. Nakken 1971. Some results of abundance estimation studies with echo integrators. Rapp. P.-v. Reun. Cons. int. Explor. Mer, 170:253-258.

Monstad, T. and I. Røttingen 1977. Loddeundersøkelser i Barentshavet i september - oktober 1977. –Fisken og Havet, 77(3):13-28. [In Norwegian]

Ozhigin V.K. and G.I. Luka 1985. Some peculiarities of capelin migrations depending on thermal conditions in the Barents Sea. –Pp 135-147 in: Gjøsæter, H (ed.): The proceedings of the Soviet-Norwegian symposium on the Barents Sea capelin. Institute of Marine Research, Bergen, Norway, 1985.

Tjelmeland, S. 1985. The capelin assessment model - a documentation. –Pp. 31-44 in: Gjøsæter, H. (ed.): The proceedings of the Soviet-Norwegian symposium on the Barents Sea capelin. Institute of Marine Research, Bergen, Norway, 1985.

Table 1. Acoustic surveys of the Barents Sea capelin stock in August - October 1971 - 96.

Year	Time period	Vessels	Reference
1971	23 Aug. - 29 Sep.	"G.O. Sars"	Dragesund and Nakken 1972
1972	5 Aug. - 11 Sep.	"G.O. Sars", "Johan Hjort"	Gjøsæter et al. 1972
1973	16 Sep- - 8 Oct.	"G.O. Sars", "Johan Hjort"	Dommasnes et al. 1974
1974	15 Sep. - 12 Oct.	"G.O. Sars", "Havdrøn"	Buzeta et al. 1975
1975	12 Sep. - 15 Oct.	"G.O. Sars", "Johan Hjort", "Poisk"	Dommasnes, Nakken and Røttingen 1976
1976	11 Sep. - 1 Oct.	"G.O. Sars", "Johan Hjort", "Odissey"	Dommasnes and Røttingen 1977
1977	16 Sep. - 7 Oct.	"G.O. Sars", "Johan Hjort", "Odissey"	Monstad and Røttingen 1977
1978	14 Sep. - 11 Oct.	"G.O. Sars", "Johan Hjort", "Poisk"	Dommasnes, Loeng and Monstad 1979
1979	30 Aug. - 28 Sep.	"G.O. Sars", "Johan Hjort", "Poisk"	Mamylov and Dommasnes 1979
1980	10 Sep. - 5 Oct.	"G.O. Sars" 10.9 - 5.10 "Johan Hjort" 10.9 - 5.10 "Poisk" 10-26.9	Anon. 1980
1981	7 Sep. - 4 Oct.	"G.O. Sars" 8.9 - 4.10 "Johan Hjort" 7 - 28.9 "Persey III" 8.9 - 4.10	Anon. 1981
1882	7 Sep. - 10 Oct.	"G.O. Sars" 7.9 - 3.10 "Johan Hjort" 7.9 - 3.10 "Persey III" 10.9 - 3.10 "Poisk" 10.9 - 10.10	Anon. 1982
1983	6 - 30 Sep.	"G.O. Sars" 6 - 30.9 "Michael Sars" 6 - 30.9 "Persey III" 6 - 30.9 "Poisk" 17 - 30.9	Anon. 1983
1984	4 - 24 Sep.	"G.O. Sars" 4 - 24.9 "Michael Sars" 5 - 24.9 "Persey III" 5 - 24.9 "Kokshaysk" 5 - 24.9	Anon. 1984
1985	6 Sep - 6 Oct	"G.O. Sars" 6.9 - 6.10 "Michael Sars" 6.9 - 6.10 "Vilnyus" 6.9 - 6.10 "Kokshaysk" 6.9 - 6.10	Anon 1985
1986	3 Sep - 13 Oct	"G.O. Sars" 6.9 - 6.10 "Michael Sars" 6.9 - 6.10 "Eldjarn" 7.9 - 13.10 "Vilnyus" 6.9 - 6.10 "Kokshaysk" 6.9 - 6.10	Anon. 1986
1987	6 Sep - 12 Oct	"G.O. Sars" 4.9 - 12.10 "Michael Sars" 16 - 25.9 "Eldjarn" 6.9 - 12.10 "Vilnyus" 6.9 - 12.10 "Artemida" 6.9 - 12.10 "Persey III" 6.9 - 12.10 "Prof. Marti" 6 - 23.9	Anon. 1987

Table 1 (continued)

Year	Time period	Vessels	Reference
1988	8 Sep - 21 Oct	"G.O. Sars" 10.9 - 18.10 "Michael Sars" 8.9 - 13.10 "Eldjarn" 10.9 - 21.10 "Prof. Marti" 12.9 - 15.10 "Artemida" 19.9 - 15.10 "Pinro" 11.9 - 14.10	Anon. 1988
1989	13 Sep - 3.Oct	"G.O. Sars" 13.9 - 3.10 "Michael Sars" 13.9 - 3.10 "Eldjarn" 13.9 - 27.10 "Prof. Marti" 13.9 - 1.10 "Persey III" 14.9 - 4.10 "Pinro" 16.9 - 2.10	Anon. 1989
1990	7 Sep - 6 Oct	"G.O. Sars" 8.9 - 7.10 "Michael Sars" 7.9 - 6.10 "Eldjarn" 6.9 - 7.10 "Prof. Marti" 12.9 - 4.10 "Vilnius" 14.9 - 4.10 "Pinro" 9.9 - 2.10	Anon. 1990
1991	12 Sep - 6 Oct	"G.O. Sars" 13.9 - 6.10 "Michael Sars" 12.9 - 4.10 "Johan Hjort" 12.9 - 1.10 "Prof. Marti" 13.9 - 6.10 "Fridtjof Nansen" 19.9 -6.10 "Pinro" 20.9 - 6.10	Anon. 1991
1992	10 Sep - 6 Oct	"G.O. Sars" 10.9 - 7.10 "Michael Sars" 10.9 - 7.10 "Johan Hjort" 12.9 - 5.10 "Prof. Marti" 12.9 - 6.10 "Fridtjof Nansen" 10.9 - 6.10	Anon. 1992
1993	9 Sep - 3 Oct	"G.O. Sars" 9.9 - 3.10 "Johan Hjort" 9 - 28.9 "Prof. Marti" 13.9 - 3.10 "Fridtjof Nansen" 9.9 - 3.10 "Pinro" 9.9 - 3.10	Anon. 1993
1994	8 Sep - 3 Oct	"G.O. Sars" 9.9 - 3.10 "Johan Hjort" 8 - 30.9 "Prof. Marti" 13.9 - 3.10 "Fridtjof Nansen" 10.9 - 3.10 "Atlantida" 10.9 - 3.10	Anon. 1994
1995	12 Sep - 1 Oct	"G.O. Sars" 13.9 - 1.10 "Johan Hjort" 13.9 - 1.10 "Prof. Marti" 13.9 - 1.10 "Fridtjof Nansen" 13.9 - 1.10	Anon. 1995
1996	12 Sep - 2 Oct	"G.O. Sars" 12.9 - 2.10 "Johan Hjort" 12 - 30.9 "Atlantida" 12.9 - 1.10 "Persey III" 12 - 30.9	Anon. 1996
1997	12 Sep – 2 Oct	"G.O. Sars" 12.9 - 1.10 "Johan Hjort" 12 – 2.10 "Atlantida" 12.9 - 2.10	Anon. 1997

Table 2. Acoustic abundance estimate of Barents Sea capelin in autumn 1972, based on TS = 19.1 $log\ L$ -74.0. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1971	1970	1969	1968	1967	(10^9)	(10^3 t)	weight (g)
6.0 - 6.5	2.63					2.63	2	0.7
6.5 - 7.0	5.12					5.12	5	1.0
7.0 - 7.5	11.89					11.89	14	1.2
7.5 - 8.0	26.62					26.62	45	1.7
8.0 - 8.5	32.85					32.85	72	2.2
8.5 - 9.0	31.68					31.68	95	3.0
9.0 - 9.5	21.67					21.67	65	3.0
9.5 - 10.0	12.12					12.12	49	4.0
10.0 - 10.5	6.10					6.10	23	3.8
10.5 - 11.0	1.74	1.09				2.83	13	4.6
11.0 - 11.5		2.05				2.05	11	5.5
11.5 - 12.0		4.42	0.20			4.62	30	6.4
12.0 - 12.5		14.34	0.39			14.73	111	7.5
12.5 - 13.0		31.56	4.66	0.42		36.64	302	8.2
13.0 - 13.5		38.81	21.09	0.66		60.56	568	9.4
13.5 - 14.0		28.78	34.25	1.73		64.76	696	10.8
14.0 - 14.5		11.88	40.83	1.65		54.36	637	11.7
14.5 - 15.0		4.62	27.58	2.92		35.12	467	13.3
15.0 - 15.5		2.48	17.09	2.35	0.20	22.12	325	14.7
15.5 - 16.0		0.73	10.22	2.85	0.16	13.96	222	15.9
16.0 - 16.5		0.38	6.24	3.22	0.46	10.30	194	18.8
16.5 - 17.0			3.99	3.35	0.26	7.60	149	19.6
17.0 - 17.5			1.95	2.37	0.20	4.52	103	22.8
17.5 - 18.0			0.85	0.84	0.27	1.96	44	22.5
18.0 - 18.5			0.39	0.64	0.12	1.15	31	27.2
18.5 - 19.0				0.04	0.06	0.10	3	27.5
19.0 - 19.5					0.22	0.22	6	28.0
19.5 - 20.0								
20.0 - 20.5								
20.5 - 21.0					0.07	0.07	2	30.0
TSN (10^9)	152.42	141.14	169.73	23.04	2.02	488.35		
TSB (10^3 t)	378	1326	2149	388	44		4286	
Mean length (cm)	8.47	13.23	14.44	15.71	17.15	12.30		
Mean weight (g)	2.5	9.4	12.7	16.9	21.7			8.8
SSN (10^9)		20.09	109.14	20.23	2.02	151.48		
SSB (10^3 t)		256	1528	356	44		2184	

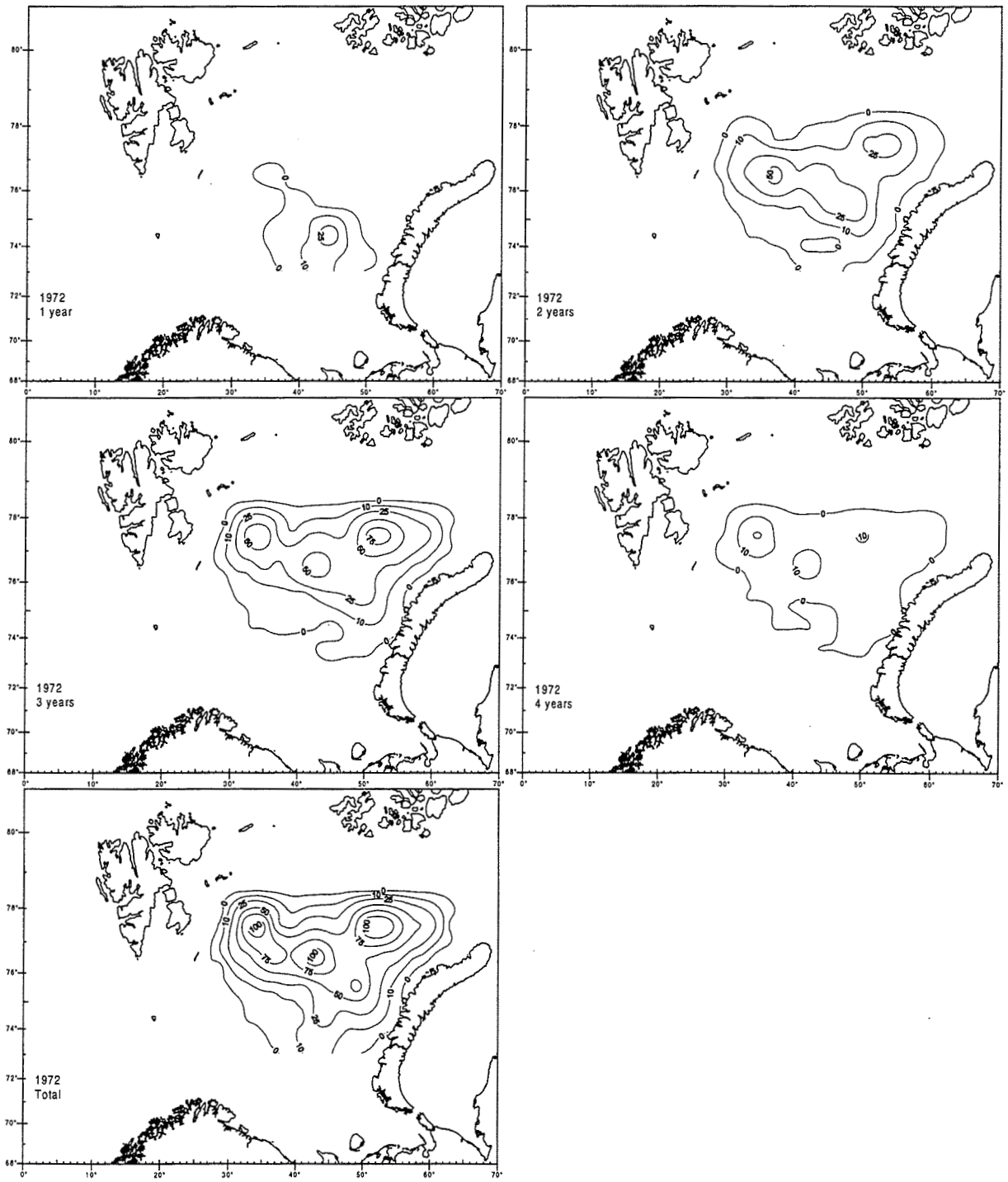

Figure 1. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1972.

Table 3. Acoustic abundance estimate of Barents Sea capelin in autumn 1973, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1972	1971	1970	1969	1968	(10^9)	(10^3 t)	weight (g)
6.5 - 7.0	7.79					7.79	8	1.0
7.0 - 7.5	11.13	1.82				12.95	18	1.3
7.5 - 8.0	11.43					11.43	19	1.7
8.0 - 8.5	30.09	1.31				31.40	65	2.1
8.5 - 9.0	70.67	2.16				72.83	158	2.2
9.0 - 9.5	118.32	14.38				132.70	376	2.8
9.5 - 10.0	123.91	34.78				158.69	505	3.2
10.0 - 10.5	72.85	64.66				137.51	533	3.9
10.5 - 11.0	45.97	51.58				97.55	451	4.6
11.0 - 11.5	23.11	49.74				72.85	403	5.5
11.5 - 12.0	7.26	44.62	0.52			52.40	340	6.5
12.0 - 12.5	2.23	40.40				42.63	320	7.5
12.5 - 13.0	2.43	23.87	0.40			26.70	234	8.8
13.0 - 13.5	0.69	16.99	1.24			18.92	191	10.1
13.5 - 14.0	0.22	12.57	2.41			15.20	174	11.5
14.0 - 14.5	0.36	6.86	2.96	0.23		10.41	132	12.7
14.5 - 15.0		3.32	5.45	0.42		9.19	132	14.4
15.0 - 15.5		2.49	5.99	1.33		9.81	158	16.1
15.5 - 16.0		2.28	5.16	1.95		9.39	177	18.9
16.0 - 16.5		0.39	5.48	3.46		9.33	196	21.0
16.5 - 17.0		0.36	5.48	2.88	0.05	8.77	209	23.8
17.0 - 17.5		0.45	2.85	2.75	0.05	6.10	157	25.7
17.5 - 18.0			1.12	2.42	0.08	3.62	110	30.5
18.0 - 18.5			0.69	1.32		2.01	65	32.2
18.5 - 19.0				0.30		0.30	11	36.7
19.0 - 19.5				0.03		0.03	1	38.0
19.5 - 20.0				0.02		0.02	1	53.0
TSN (10^9)	528.46	375.03	39.75	17.11	0.18	960.53		
TSB (10^3 t)	1689	2315	726	408	5		5144	
Mean length (cm)	9.56	11.34	15.56	16.72	17.33	10.63		
Mean weight (g)	3.2	6.2	18.3	23.8	30.1			5.4
SSN (10^9)	0.36	16.15	35.18	17.11	0.18	68.98		
SSB (10^3 t)	5	246	685	408	5		1349	

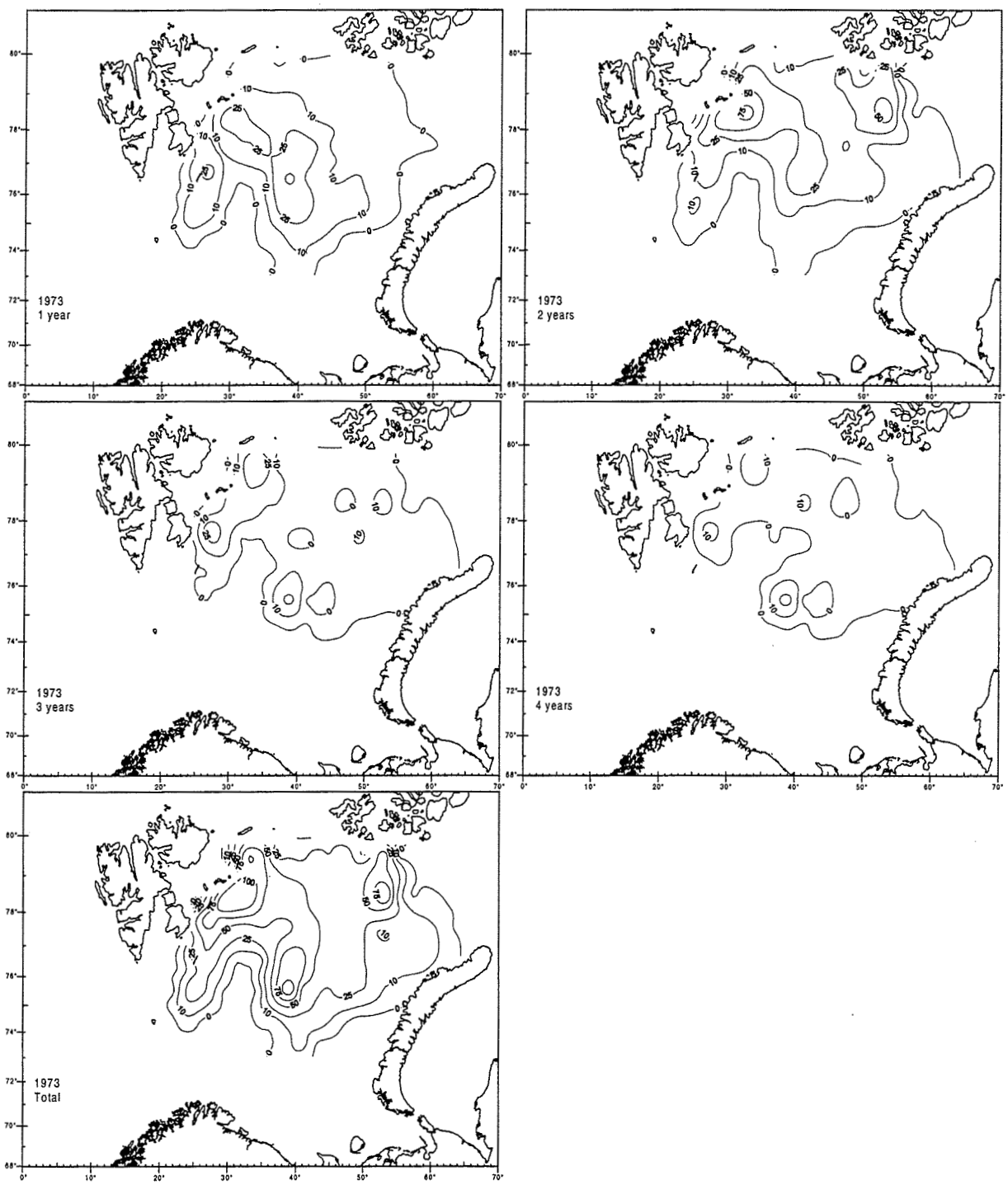

Figure 2. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1973.

Table 4. Acoustic abundance estimate of Barents Sea capelin in autumn 1974, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1973	1972	1971	1970	1969	(10^9)	(10^3 t)	weight (g)
5.5 - 6.0	0.13					0.13	0	0.7
6.0 - 6.5	0.35					0.35	0	0.8
6.5 - 7.0	0.51					0.51	1	1.0
7.0 - 7.5	2.28	0.11				2.39	3	1.2
7.5 - 8.0	3.78	0.05				3.83	5	1.4
8.0 - 8.5	10.63	0.98	0.06			11.67	22	1.9
8.5 - 9.0	23.27	1.10				24.37	54	2.2
9.0 - 9.5	33.18	4.28	0.29			37.75	106	2.8
9.5 - 10.0	64.44	17.26	1.31			83.01	258	3.1
10.0 - 10.5	74.67	79.12	8.50			162.29	621	3.8
10.5 - 11.0	59.27	116.04	15.58			190.89	816	4.3
11.0 - 11.5	24.65	104.74	21.10			150.49	751	5.0
11.5 - 12.0	5.55	83.14	21.31			110.00	633	5.8
12.0 - 12.5	1.56	61.02	20.17			82.75	564	6.8
12.5 - 13.0	0.31	35.52	15.12	0.10		51.05	403	7.9
13.0 - 13.5	0.10	19.37	15.68	0.23		35.38	325	9.2
13.5 - 14.0	0.08	10.06	14.44	0.05		24.63	263	10.7
14.0 - 14.5	0.04	8.05	12.13	0.38		20.60	256	12.4
14.5 - 15.0		3.70	9.82	0.13		13.65	194	14.2
15.0 - 15.5		2.04	6.23	0.35		8.62	140	16.3
15.5 - 16.0		0.57	5.28	0.16		6.01	113	18.8
16.0 - 16.5		0.23	3.08	0.59		3.90	83	21.3
16.5 - 17.0		0.03	1.60	0.40		2.03	49	24.3
17.0 - 17.5		0.03	0.81	0.48	0.07	1.39	35	25.1
17.5 - 18.0			0.14	0.24		0.38	11	28.3
18.0 - 18.5			0.14	0.15		0.29	9	32.6
18.5 - 19.0			0.25			0.25	8	32.6
19.0 - 19.5			0.07	0.10		0.17	7	39.0
19.5 - 20.0				0.05		0.05	2	42.0
TSN (10^9)	304.80	547.44	173.11	3.41	0.07	1028.83		
TSB (10^3 t)	1063	3063	1534	71	2		5733	
Mean length (cm)	10.01	11.42	12.72	16.03	17.25	11.23		
Mean weight (g)	3.5	5.6	8.9	20.8	25.0			5.6
SSN (10^9)	0.04	14.65	39.55	3.03	0.07	57.34		
SSB (10^3 t)	0	203	635	67	2		907	

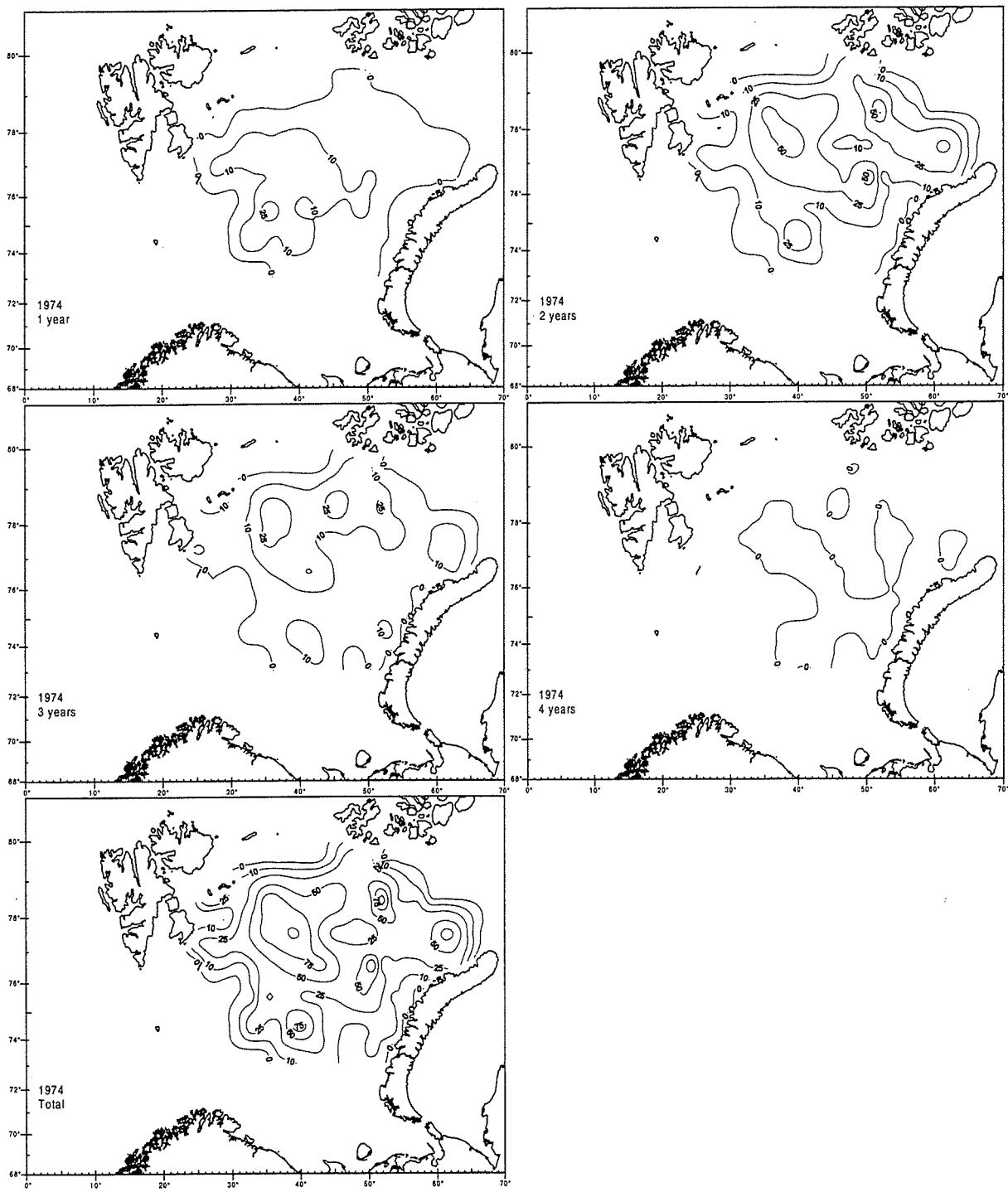

Figure 3. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1974.

Table 5. Acoustic abundance estimate of Barents Sea capelin in autumn 1975, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1974	1973	1972	1971	1970	(10^9)	(10^3 t)	weight (g)
6.5 - 7.0	0.06					0.06		0.7
7.0 - 7.5	0.19					0.19	0	1.0
7.5 - 8.0	1.52					1.52	2	1.2
8.0 - 8.5	4.42	0.44				4.86	9	1.8
8.5 - 9.0	17.62	0.21				17.83	38	2.1
9.0 - 9.5	38.57	2.73				41.30	109	2.6
9.5 - 10.0	42.67	7.99				50.66	164	3.2
10.0 - 10.5	47.51	12.13				59.64	236	4.0
10.5 - 11.0	24.26	33.20	0.32			57.78	256	4.4
11.0 - 11.5	9.70	50.53	10.06	0.39		70.68	372	5.3
11.5 - 12.0	3.09	79.06	29.27	0.86		112.28	672	6.0
12.0 - 12.5	0.82	62.63	39.08	3.22		105.75	757	7.2
12.5 - 13.0		43.06	52.02	4.89		99.97	852	8.5
13.0 - 13.5		25.71	43.08	8.39		77.18	770	10.0
13.5 - 14.0		16.36	34.70	7.20		58.26	658	11.3
14.0 - 14.5		6.64	26.78	9.68		43.10	554	12.9
14.5 - 15.0		2.35	19.45	8.63		30.43	453	14.9
15.0 - 15.5		2.58	15.62	5.62		23.82	385	16.2
15.5 - 16.0		1.43	8.93	10.80		21.16	395	18.7
16.0 - 16.5		1.03	6.65	8.22		15.90	336	21.2
16.5 - 17.0			4.94	6.10		11.04	268	24.2
17.0 - 17.5			2.26	5.60	0.27	8.13	229	28.1
17.5 - 18.0			1.41	4.54		5.95	179	30.1
18.0 - 18.5			1.02	1.64		2.66	89	33.5
18.5 - 19.0			0.08	0.58		0.66	24	36.1
TSN (10^9)	190.43	348.08	295.67	86.36	0.27	920.81		
TSB (10^3 t)	654	2394	3270	1480	8		7806	
Mean length (cm)	9.87	12.00	13.44	15.07	17.25	12.31		
Mean weight (g)	3.4	6.9	11.1	17.1	31.0			8.5
SSN (10^9)		14.03	87.14	61.41	0.27	162.85		
SSB (10^3 t)		211	1459	1238	8		2913	

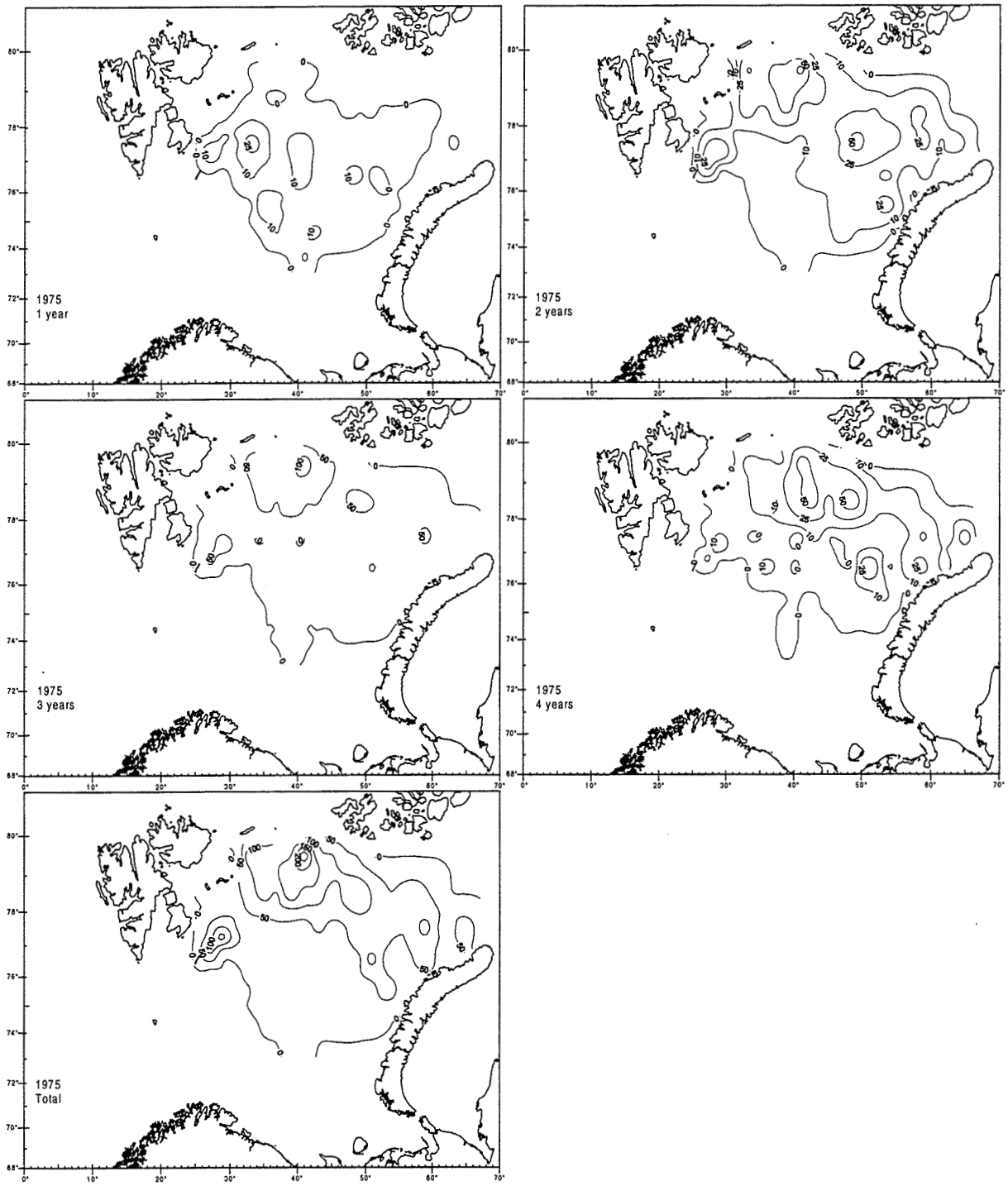

Figure 4. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1975.

Table 6. Acoustic abundance estimate of Barents Sea capelin in autumn 1976, based on *TS* = 19.1 *log L -74.0.* TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1975	1974	1973	1972	1971	(10^9)	(10^3 t)	weight (g)
7.0 - 7.5	0.23					0.23	0	1.0
7.5 - 8.0	3.19					3.19	4	1.2
8.0 - 8.5	9.18					9.18	13	1.4
8.5 - 9.0	14.69	0.24				14.93	24	1.6
9.0 - 9.5	21.14	0.11				21.25	53	2.5
9.5 - 10.0	25.29	0.10				25.39	77	3.0
10.0 - 10.5	50.16	0.70				50.86	191	3.8
10.5 - 11.0	44.02	2.77	0.47			47.26	205	4.3
11.0 - 11.5	28.45	13.35	0.57			42.37	219	5.2
11.5 - 12.0	11.75	38.06	4.97	0.54		55.32	339	6.1
12.0 - 12.5	2.38	49.16	10.81	1.26		63.61	439	6.9
12.5 - 13.0	0.35	45.34	19.59	3.14	0.28	68.70	548	8.0
13.0 - 13.5		30.86	19.23	4.22	0.49	54.80	508	9.3
13.5 - 14.0		25.21	22.81	7.77	0.06	55.85	600	10.7
14.0 - 14.5		15.06	19.66	7.61	1.38	43.71	543	12.4
14.5 - 15.0		8.20	22.45	9.65	1.15	41.45	587	14.2
15.0 - 15.5		2.50	15.07	9.91	1.28	28.76	467	16.2
15.5 - 16.0		0.99	13.62	8.38	2.45	25.44	463	18.2
16.0 - 16.5		0.24	5.02	6.41	0.94	12.61	266	21.1
16.5 - 17.0		0.17	4.07	5.31	0.53	10.08	243	24.1
17.0 - 17.5			3.08	5.49	1.09	9.66	258	26.7
17.5 - 18.0			1.34	3.31	0.83	5.48	167	30.4
18.0 - 18.5			0.05	2.45	1.10	3.60	123	34.1
18.5 - 19.0			0.18	0.79	0.23	1.20	47	39.2
19.0 - 19.5				0.29	0.55	0.84	35	41.9
19.5 - 20.0								
20.0 - 20.5				0.04		0.04	2	56.0
TSN (10^9)	210.83	233.06	162.99	76.57	12.36	695.81		
TSB (10^3 t)	783	1924	2091	1350	269		6417	
Mean length (cm)	10.21	12.74	14.15	15.29	16.04	12.64		
Mean weight (g)	3.7	8.3	12.8	17.6	21.7			9.2
SSN (10^9)		27.16	84.54	59.64	11.53	182.87		
SSB (10^3 t)		371	1390	1184	255		3199	

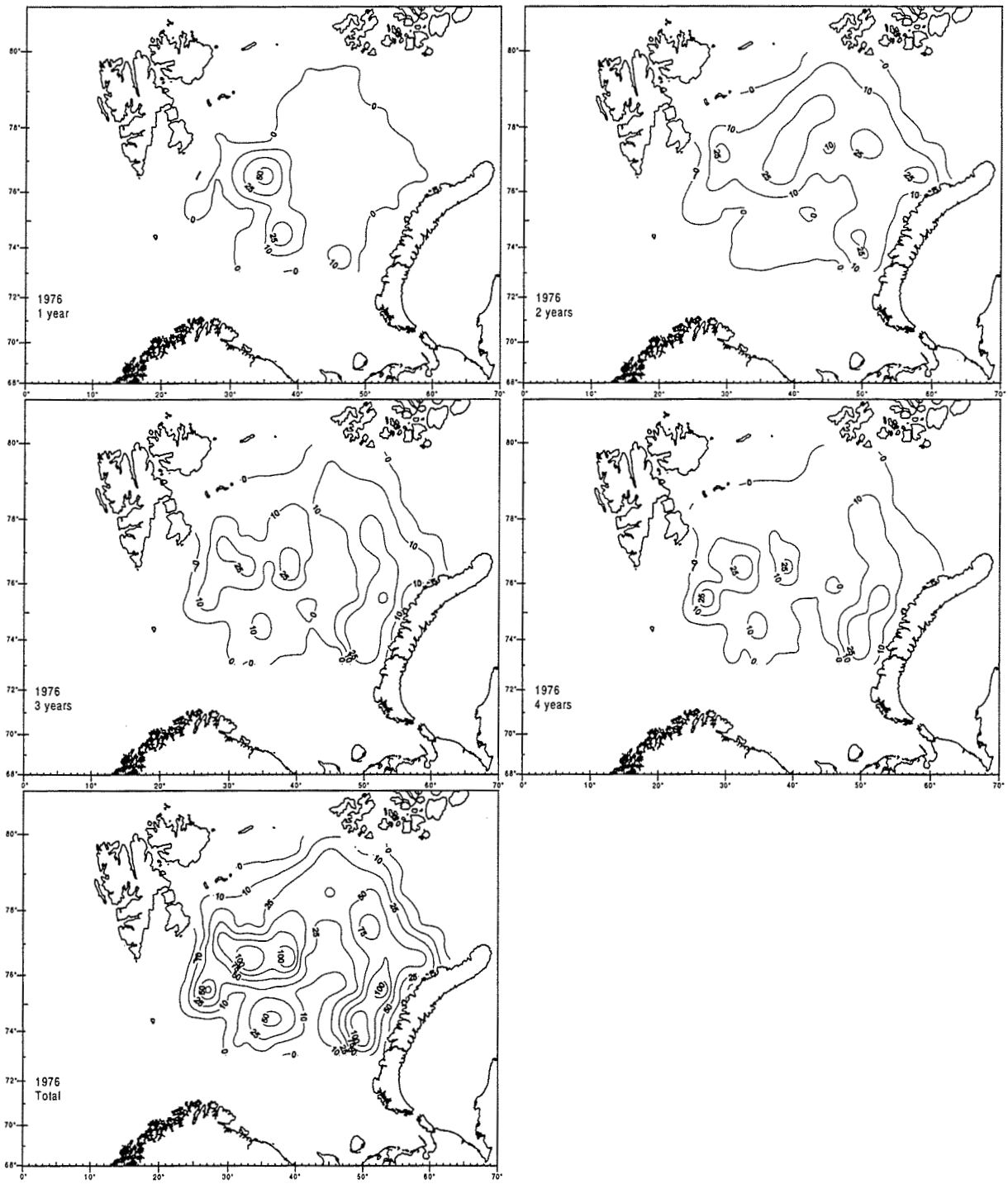

Figure 5. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1976.

Table 7. Acoustic abundance estimate of Barents Sea capelin in autumn 1977, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1976	**1975**	**1974**	**1973**	**1972**	**(10^9)**	**(10^3 t)**	**weight (g)**
5.0 - 5.5	4.51					4.51	1	0.3
5.5 - 6.0	8.66					8.66	4	0.4
6.0 - 6.5	18.05					18.05	9	0.5
6.5 - 7.0	24.78					24.78	15	0.6
7.0 - 7.5	38.35					38.35	27	0.7
7.5 - 8.0	38.60					38.60	46	1.2
8.0 - 8.5	54.55	0.02				54.57	102	1.9
8.5 - 9.0	52.21	0.53				52.74	118	2.2
9.0 - 9.5	41.39	1.48				42.87	121	2.8
9.5 - 10.0	38.75	2.37				41.12	130	3.2
10.0 - 10.5	25.92	4.07	0.02			30.01	113	3.8
10.5 - 11.0	10.10	7.47	0.02			17.59	76	4.3
11.0 - 11.5	3.11	18.75	0.13			21.99	111	5.0
11.5 - 12.0	0.77	28.62	0.40	0.17		29.96	177	5.9
12.0 - 12.5	0.05	31.50	1.94	0.16		33.65	239	7.1
12.5 - 13.0		24.22	4.04	0.39		28.65	234	8.2
13.0 - 13.5		22.84	7.70	1.24		31.78	310	9.8
13.5 - 14.0		12.62	11.18	2.02		25.82	291	11.3
14.0 - 14.5		8.46	11.64	2.86	0.34	23.30	304	13.1
14.5 - 15.0		5.38	13.63	4.38	0.26	23.65	352	14.9
15.0 - 15.5		3.07	10.95	4.57	0.85	19.44	332	17.1
15.5 - 16.0		2.25	13.20	5.44	1.29	22.18	423	19.1
16.0 - 16.5		0.93	8.44	4.71	1.00	15.08	332	22.0
16.5 - 17.0		0.14	8.20	3.64	0.84	12.82	314	24.5
17.0 - 17.5		0.12	3.51	4.77	1.11	9.51	264	27.7
17.5 - 18.0			2.44	3.37	1.40	7.21	220	30.5
18.0 - 18.5			0.97	1.67	0.14	2.78	92	33.2
18.5 - 19.0			0.14	0.66	0.05	0.85	30	35.0
19.0 - 19.5				0.20		0.20	8	42.0
19.5 - 20.0				0.06		0.06	3	48.0
TSN (10^9)	359.80	174.84	98.55	40.31	7.28	680.78		
TSB (10^3 t)	719	1412	1655	844	167		4796	
Mean length (cm)	8.39	12.49	15.00	15.91	16.45	10.93		
Mean weight (g)	2.0	8.1	16.8	20.9	22.9			7.0
SSN (10^9)		20.35	73.12	36.33	7.28	137.08		
SSB (10^3 t)		314	1390	802	167		2674	

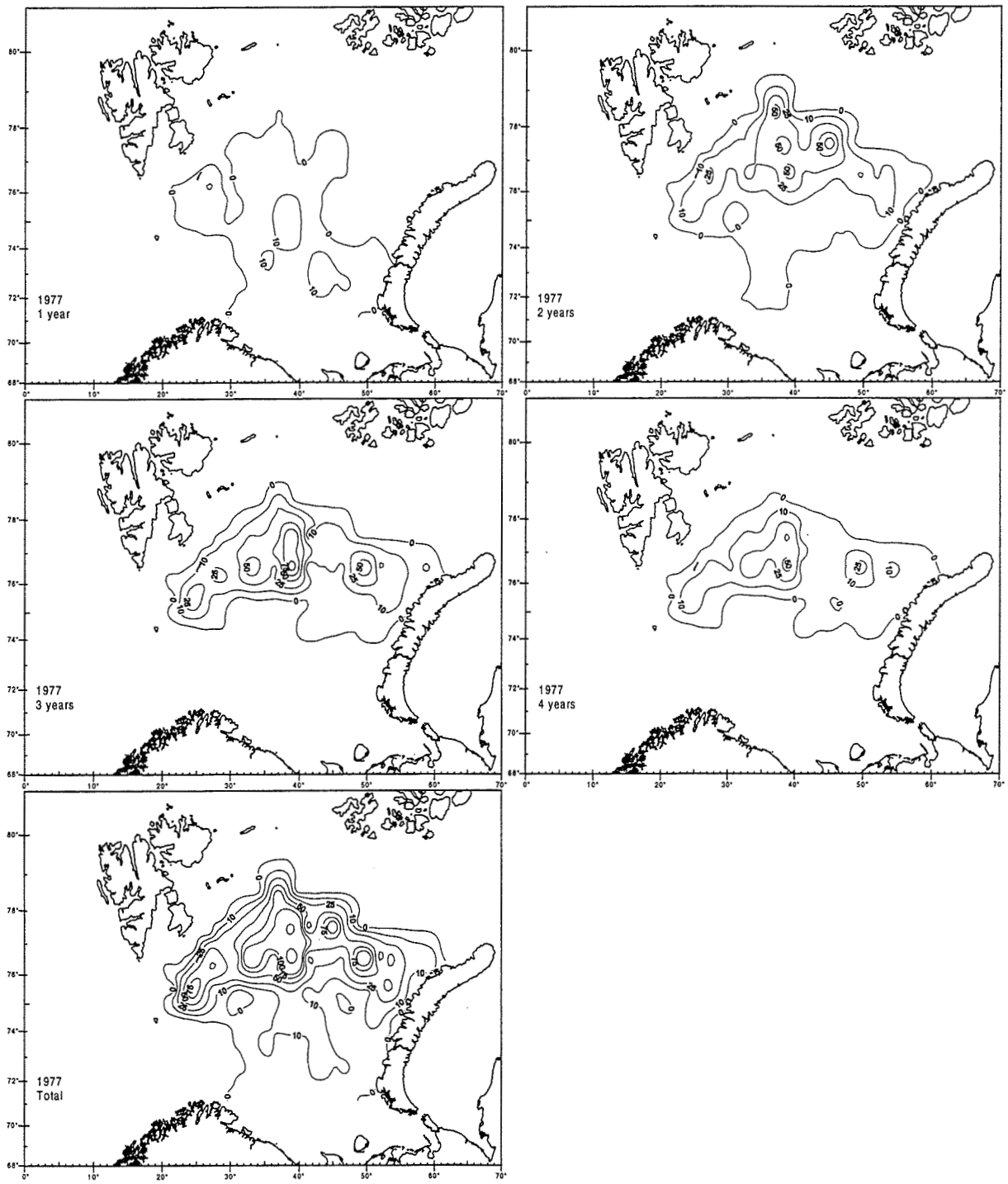

Figure 6. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1977.

Table 8. Acoustic abundance estimate of Barents Sea capelin in autumn 1978, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1977	1976	1975	1974	1973	(10^9)	(10^3 t)	weight (g)
6.5 - 7.0	0.29	0.03				0.32	0	0.8
7.0 - 7.5	4.39	0.08				4.47	5	1.1
7.5 - 8.0	3.10	0.10				3.20	5	1.7
8.0 - 8.5	7.06	0.49				7.55	17	2.3
8.5 - 9.0	9.26	1.07				10.33	26	2.5
9.0 - 9.5	23.89	3.42				27.31	72	2.6
9.5 - 10.0	22.95	7.91				30.86	98	3.2
10.0 - 10.5	7.92	28.61				36.53	145	4.0
10.5 - 11.0	3.10	48.75				51.85	238	4.6
11.0 - 11.5	1.57	69.46	0.43			71.46	381	5.3
11.5 - 12.0		71.67	0.61			72.28	438	6.1
12.0 - 12.5		68.23	0.84			69.07	499	7.2
12.5 - 13.0		40.53	2.16			42.69	359	8.4
13.0 - 13.5		23.30	7.53			30.83	306	9.9
13.5 - 14.0		13.31	9.80			23.11	256	11.1
14.0 - 14.5		5.88	10.08	0.38		16.34	214	13.1
14.5 - 15.0		4.30	12.11	0.98	0.12	17.51	255	14.6
15.0 - 15.5		2.00	10.61	0.90		13.51	229	16.9
15.5 - 16.0		1.46	7.99	2.15		11.60	225	19.4
16.0 - 16.5		0.61	6.10	1.57	0.21	8.49	180	21.2
16.5 - 17.0		0.43	3.87	1.79	0.10	6.19	146	23.6
17.0 - 17.5			1.80	0.84	0.05	2.69	72	26.8
17.5 - 18.0		0.05	0.88	0.15	0.05	1.13	34	30.3
18.0 - 18.5			0.67	0.10		0.77	26	33.6
18.5 - 19.0			0.29		0.13	0.42	18	42.4
19.0 - 19.5			0.08			0.08	3	36.0
TSN (10^9)	83.53	391.69	75.85	8.86	0.66	560.59		
TSB (10^3 t)	235	2624	1198	174	17		4247	
Mean length (cm)	9.27	11.81	14.82	16.02	16.73	11.91		
Mean weight (g)	2.8	6.7	15.8	19.7	25.0			7.6
SSN (10^9)		14.73	54.48	8.86	0.66	78.73		
SSB (10^3 t)		227	976	174	17		1402	

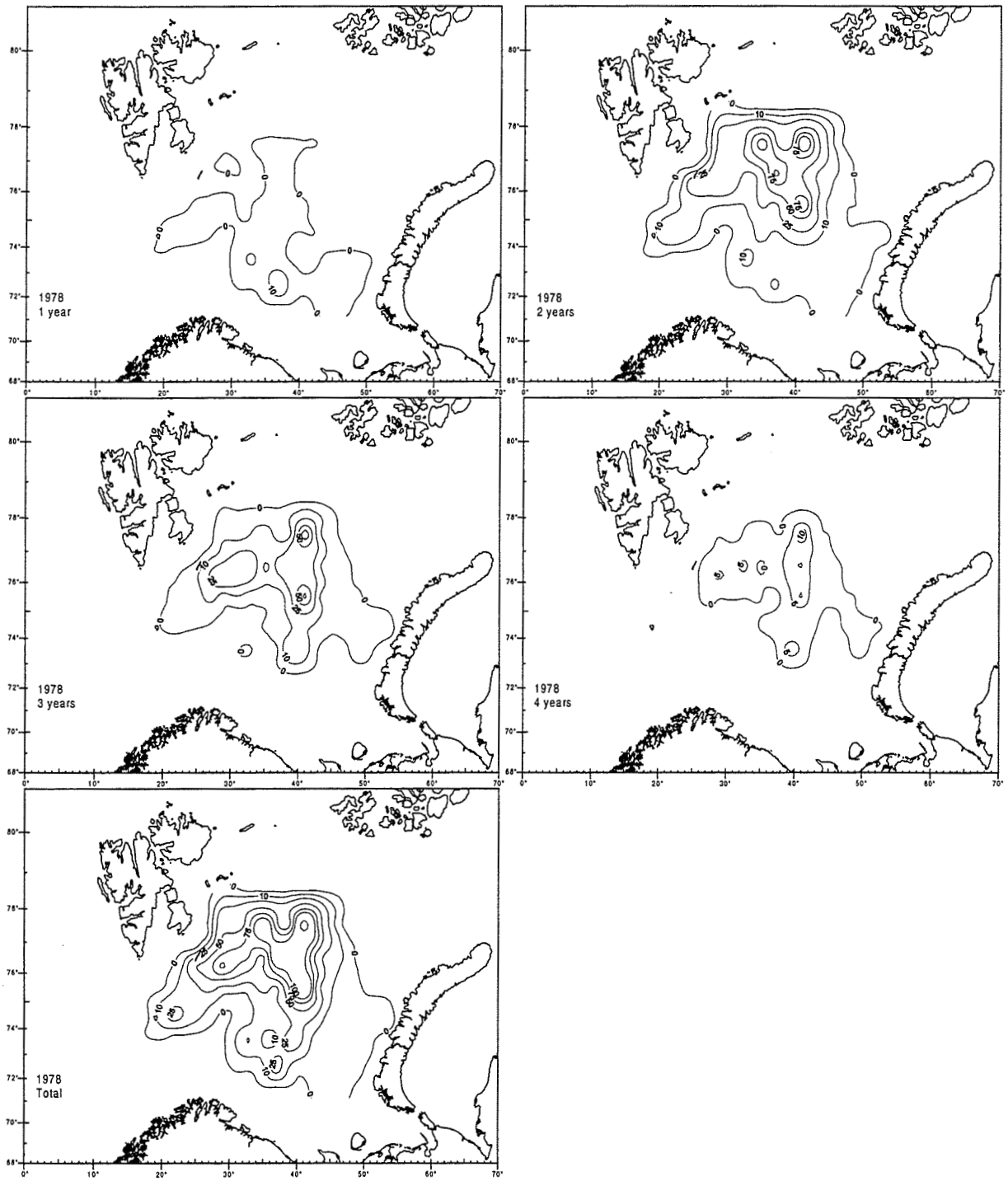

Figure 7. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1978.

Table 9. Acoustic abundance estimate of Barents Sea capelin in autumn 1979, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1978	1977	1976	1975	1974	(10^9)	(10^3 t)	weight (g)
8.0 - 8.5	0.13					0.13	0	1.8
8.5 - 9.0	0.06					0.06	0	2.2
9.0 - 9.5	0.38					0.38	1	3.0
9.5 - 10.0	1.31	0.79				2.10	7	3.4
10.0 - 10.5	3.25	4.64				7.89	34	4.3
10.5 - 11.0	2.56	14.29				16.85	76	4.5
11.0 - 11.5	2.16	29.36				31.52	165	5.2
11.5 - 12.0	1.86	67.13	1.40			70.39	428	6.1
12.0 - 12.5	0.32	84.48	1.13			85.93	613	7.1
12.5 - 13.0		65.98	10.60			76.58	622	8.1
13.0 - 13.5		39.46	22.98			62.44	591	9.5
13.5 - 14.0		19.02	16.85	0.41		36.28	400	11.0
14.0 - 14.5		5.92	17.65	0.14		23.71	304	12.8
14.5 - 15.0		1.09	14.50	0.46		16.05	240	15.0
15.0 - 15.5		0.61	12.72	0.91		14.24	243	17.1
15.5 - 16.0		0.50	6.25	0.33		7.08	138	19.5
16.0 - 16.5		0.10	5.74	0.89		6.73	144	21.4
16.5 - 17.0			1.64	0.49	0.06	2.19	53	24.1
17.0 - 17.5			1.69	0.76		2.45	67	27.4
17.5 - 18.0			0.55	0.44		0.99	32	32.3
18.0 - 18.5			0.08	0.06		0.14	5	34.6
TSN (10^9)	12.03	333.37	113.78	4.89	0.06	464.13		
TSB (10^3 t)	54	2470	1533	103	2		4162	
Mean length (cm)	10.71	12.32	14.24	15.99	16.75	12.79		
Mean weight (g)	4.5	7.4	13.5	21.0	27.0			9.0
SSN (10^9)		8.22	60.82	4.48	0.06	73.58		
SSB (10^3 t)		114	1012	99	2		1225	

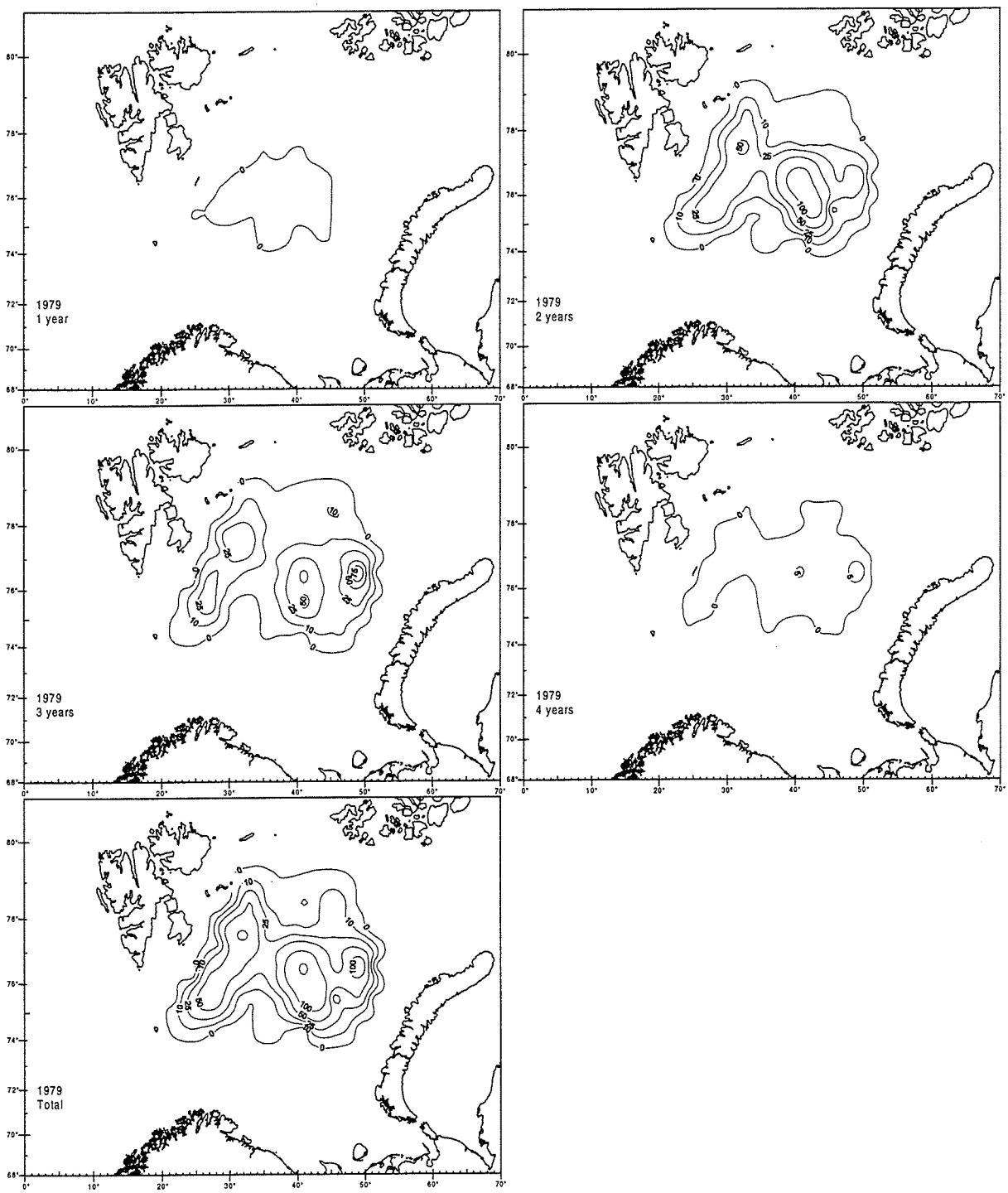

Figure 8. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1979.

Table 10. Acoustic abundance estimate of Barents Sea capelin in autumn 1980, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1979	1978	1977	1976	1975	(10^9)	(10^3 t)	weight (g)
6.5 - 7.0	0.65					0.65	1	1.0
7.0 - 7.5	2.47					2.47	3	1.0
7.5 - 8.0	2.59					2.59	3	1.0
8.0 - 8.5	5.66					5.66	10	1.7
8.5 - 9.0	14.83					14.83	30	2.0
9.0 - 9.5	25.59					25.59	60	2.4
9.5 - 10.0	26.91	0.25				27.16	83	3.1
10.0 - 10.5	29.41	0.75				30.16	119	4.0
10.5 - 11.0	51.66	3.83				55.49	259	4.7
11.0 - 11.5	57.90	11.36	0.13			69.39	367	5.3
11.5 - 12.0	31.20	24.51	0.03			55.74	345	6.2
12.0 - 12.5	12.05	33.71	0.51			46.27	342	7.4
12.5 - 13.0	5.86	31.58	1.69	0.04		39.17	340	8.7
13.0 - 13.5	2.53	30.98	4.61	0.14		38.26	389	10.2
13.5 - 14.0	0.60	27.18	11.34	0.12		39.24	452	11.5
14.0 - 14.5		18.24	23.14	1.06		42.44	559	13.2
14.5 - 15.0		7.53	28.06	1.96		37.55	553	14.7
15.0 - 15.5		4.23	27.85	3.81		35.89	606	16.9
15.5 - 16.0		1.00	18.07	4.68	0.02	23.77	452	19.0
16.0 - 16.5		0.48	14.74	4.75	0.28	20.25	445	22.0
16.5 - 17.0		0.07	9.01	4.17		13.25	335	25.3
17.0 - 17.5		0.07	5.26	3.92		9.25	264	28.6
17.5 - 18.0			4.62	3.52		8.14	262	32.1
18.0 - 18.5			2.92	2.33		5.25	192	36.5
18.5 - 19.0			1.81	1.10		2.91	117	40.2
19.0 - 19.5			1.31	0.85		2.16	91	42.3
19.5 - 20.0			0.18	0.56		0.74	37	49.3
TSN (10^9)	269.91	195.77	155.28	33.01	0.30	654.27		
TSB (10^3 t)	1213	1846	2831	818	6		6715	
Mean length (cm)	10.58	12.91	15.32	16.59	16.22	12.71		
Mean weight (g)	4.5	9.4	18.2	24.8	19.7			10.3
SSN (10^9)		31.62	136.97	32.71	0.30	201.60		
SSB (10^3 t)		456	2627	824	6		3913	

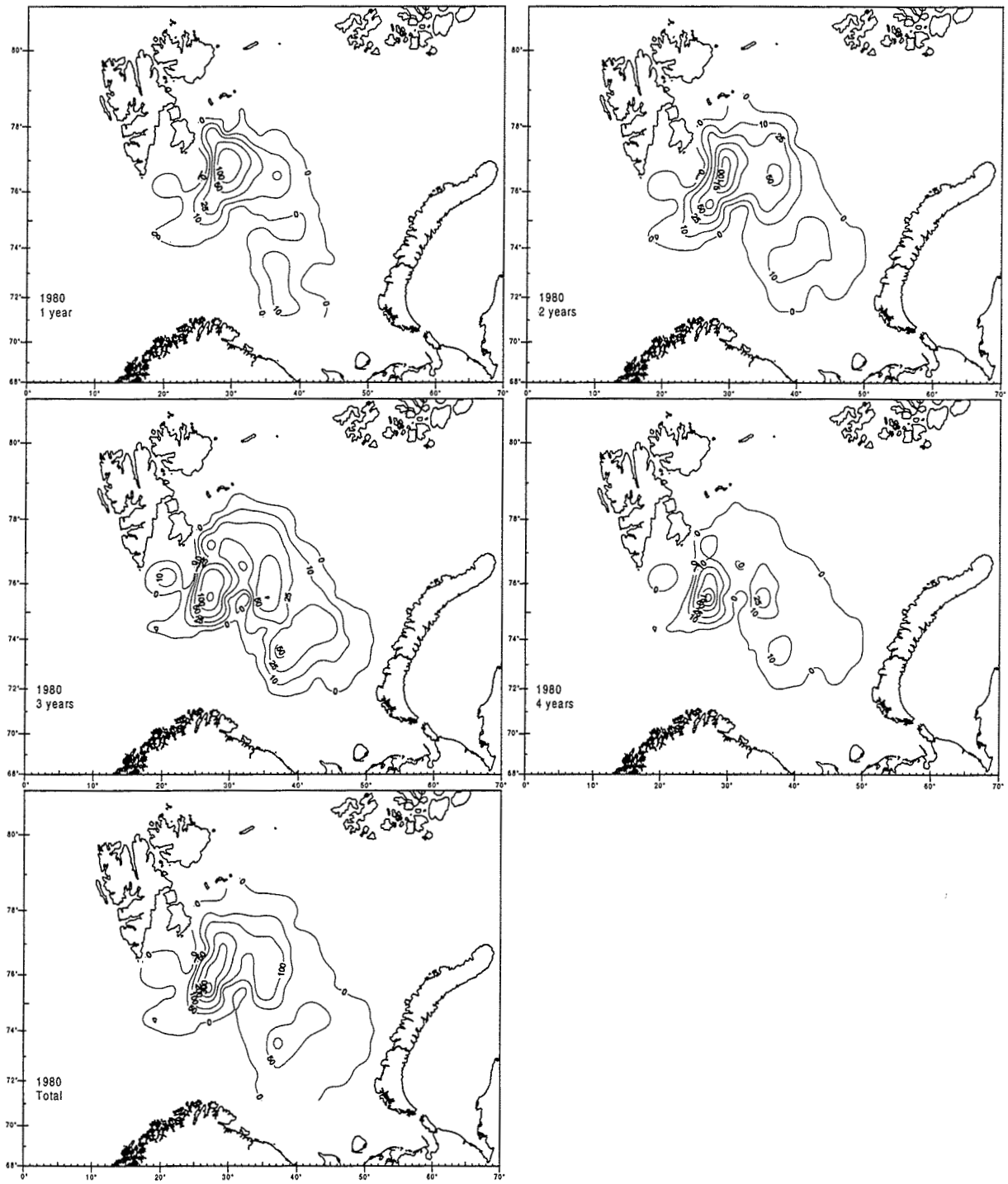

Figure 9. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1980.

Table 11. Acoustic abundance estimate of Barents Sea capelin in autumn 1981, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1980	1979	1978	1977	1976	(10^9)	(10^3 t)	weight (g)
6.0 - 6.5	8.63					8.63	8	1.0
6.5 - 7.0	19.22					19.22	19	1.0
7.0 - 7.5	33.35					33.35	33	1.0
7.5 - 8.0	60.13					60.13	78	1.3
8.0 - 8.5	65.58					65.58	118	1.8
8.5 - 9.0	58.43	0.08				58.51	123	2.1
9.0 - 9.5	52.59	0.34				52.93	137	2.6
9.5 - 10.0	41.83	1.32				43.15	131	3.0
10.0 - 10.5	26.57	2.58				29.15	109	3.7
10.5 - 11.0	21.72	4.73				26.45	114	4.3
11.0 - 11.5	7.88	8.98				16.86	89	5.3
11.5 - 12.0	2.99	17.46	0.05			20.50	128	6.2
12.0 - 12.5	1.62	30.74	0.19			32.55	234	7.2
12.5 - 13.0	1.25	41.99	0.59			43.83	364	8.3
13.0 - 13.5	0.50	32.80	2.29	0.04		35.63	343	9.6
13.5 - 14.0	0.20	23.51	4.66	0.01		28.38	316	11.1
14.0 - 14.5	0.07	15.32	6.42	0.02		21.83	277	12.7
14.5 - 15.0		6.77	7.02	0.20		13.99	202	14.4
15.0 - 15.5		3.55	7.05	1.40	0.04	12.04	197	16.4
15.5 - 16.0		1.64	6.98	2.00		10.62	190	17.9
16.0 - 16.5		0.94	4.70	1.97	0.02	7.63	156	20.4
16.5 - 17.0		0.79	3.46	2.59		6.84	156	22.8
17.0 - 17.5		0.67	1.57	1.73	0.04	4.01	107	26.7
17.5 - 18.0		0.52	1.62	1.82	0.06	4.02	120	29.8
18.0 - 18.5		0.38	0.66	1.29		2.33	78	33.3
18.5 - 19.0		0.17	0.51	0.49	0.10	1.27	46	36.4
19.0 - 19.5			0.15	0.02		0.17	8	46.0
19.5 - 20.0			0.05	0.19		0.24	12	48.0
20.0 - 20.5			0.01	0.03		0.04	2	58.5
20.5 - 21.0			0.02			0.02	1	63.0
TSN (10^9)	402.56	195.28	48.00	13.80	0.26	659.90		
TSB (10^3 t)	924	1825	816	322	8		3895	
Mean length (cm)	8.73	12.94	15.28	16.79	17.56	10.62		
Mean weight (g)	2.3	9.3	17.0	23.3	28.7			5.9
SSN (10^9)	0.07	30.75	40.22	13.75	0.26	85.05		
SSB (10^3 t)	1	469	740	321	8		1552	

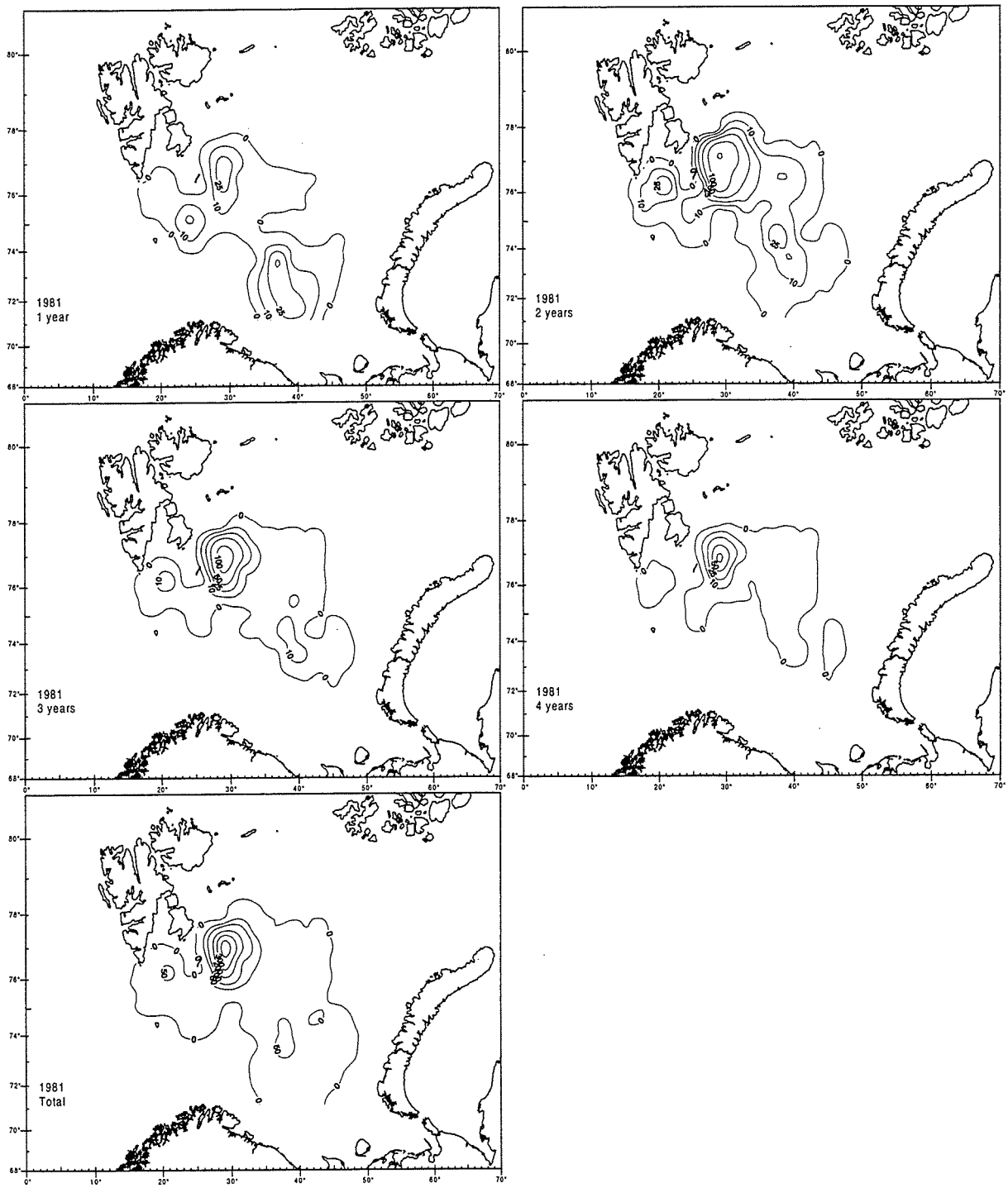

Figure 10. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1981.

Table 12. Acoustic abundance estimate of Barents Sea capelin in autumn 1982, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock. Adjusted estimate, see text for explanation.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1981	1980	1979	1978	1977	(10^9)	(10^3 t)	weight (g)
5.0 - 5.5	11.11					11.11	4	0.4
5.5 - 6.0	16.17					16.17	10	0.6
6.0 - 6.5	30.16					30.16	30	1.0
6.5 - 7.0	40.68					40.68	41	1.0
7.0 - 7.5	55.98					55.98	56	1.0
7.5 - 8.0	65.35					65.35	72	1.1
8.0 - 8.5	36.03					36.03	58	1.6
8.5 - 9.0	41.79					41.79	88	2.1
9.0 - 9.5	52.89	0.33				53.22	144	2.7
9.5 - 10.0	59.03	0.51				59.54	185	3.1
10.0 - 10.5	54.95	2.02				56.97	216	3.8
10.5 - 11.0	36.53	8.53				45.06	198	4.4
11.0 - 11.5	15.29	14.69				29.98	159	5.3
11.5 - 12.0	8.86	22.85				31.71	197	6.2
12.0 - 12.5	3.15	25.43	0.05			28.63	209	7.3
12.5 - 13.0	0.30	22.84	0.23			23.38	196	8.4
13.0 - 13.5	0.04	16.10	0.41			16.56	164	9.9
13.5 - 14.0		12.63	1.50			14.13	161	11.4
14.0 - 14.5		6.81	5.89			12.69	168	13.2
14.5 - 15.0		5.90	6.16	0.03		12.09	179	14.8
15.0 - 15.5		3.14	9.41	0.14		12.69	217	17.1
15.5 - 16.0		1.61	9.10	0.54		11.25	213	18.9
16.0 - 16.5		0.53	6.58	0.47		7.58	161	21.3
16.5 - 17.0		0.96	5.69	0.31		6.95	172	24.8
17.0 - 17.5		0.91	5.01	0.19		6.12	171	27.9
17.5 - 18.0		1.44	2.76	0.20		4.40	136	31.0
18.0 - 18.5		0.20	2.33			2.53	87	34.5
18.5 - 19.0		0.12	0.51			0.64	23	35.9
19.0 - 19.5			0.78	0.14		0.92	37	40.3
19.5 - 20.0		0.07	0.26	0.14		0.47	20	43.3
20.0 - 20.5			0.13			0.13	6	50.0
TSN (10^9)	528.31	147.62	56.82	2.16		734.91		
TSB (10^3 t)	1215	1329	1180	54			3778	
Mean length (cm)	8.57	12.70	15.91	16.76		10.51		
Mean weight (g)	2 3	9.0	20.9	24.9				5.1
SSN (10^9)		21.68	54.61	2.16		78.45		
SSB (10^3 t)		381	1156	54			1591	

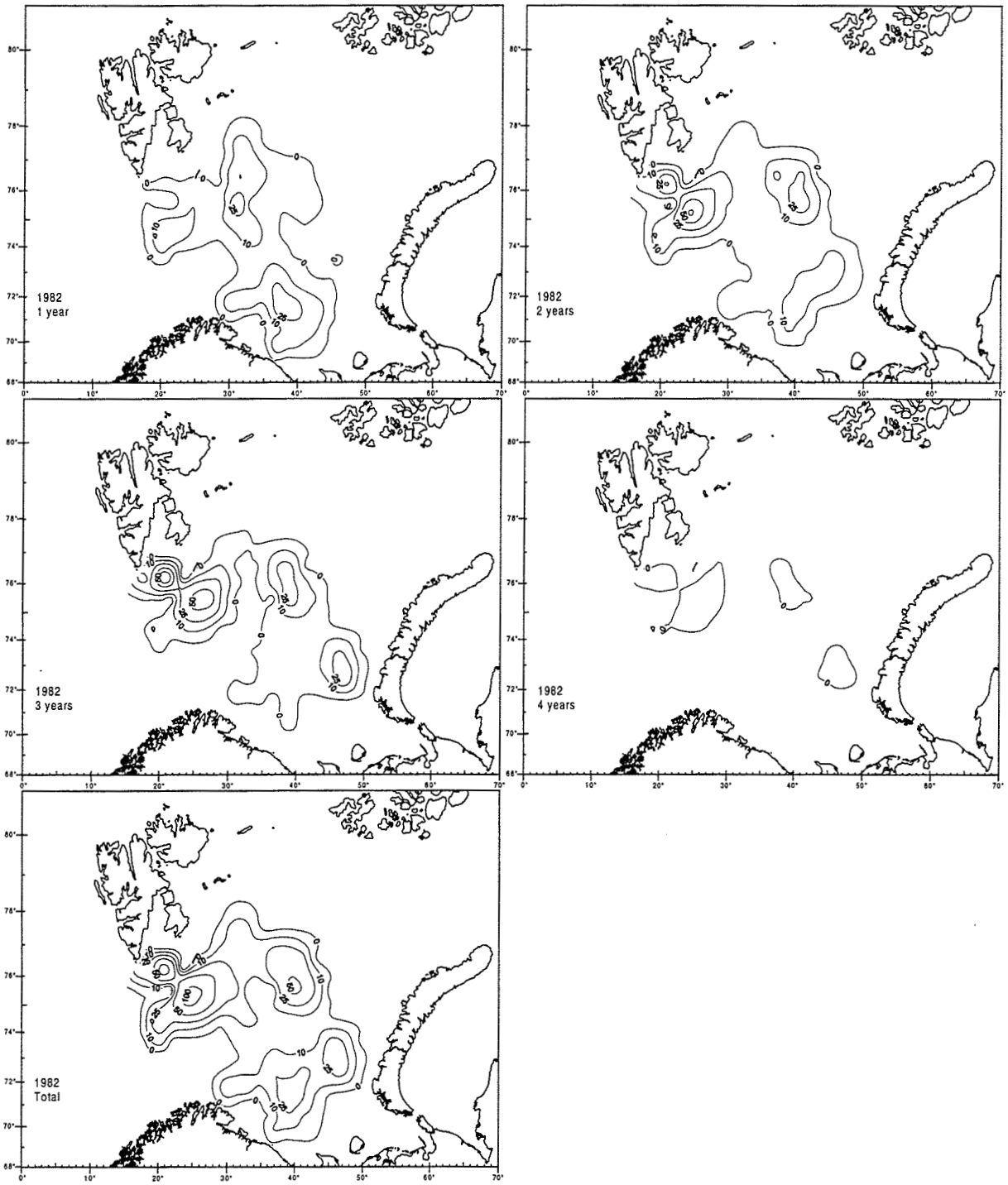

Figure 11. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1982.

Table 13. Acoustic abundance estimate of Barents Sea capelin in autumn 1983, based on *TS = 19.1 log L -74.0.* TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1982	1981	1980	1979	1978	(10^9)	(10^3 t)	weight (g)
6.5 - 7.0	5.27					5.27	5	1.0
7.0 - 7.5	7.18					7.18	7	1.0
7.5 - 8.0	10.16					10.16	11	1.1
8.0 - 8.5	27.56					27.56	56	2.0
8.5 - 9.0	96.43					96.43	208	2.2
9.0 - 9.5	119.53	1.46				120.99	340	2.8
9.5 - 10.0	109.66	2.91				112.57	353	3.1
10.0 - 10.5	67.10	4.40				71.50	278	3.9
10.5 - 11.0	38.15	15.71				53.86	250	4.6
11.0 - 11.5	21.61	23.39				45.00	249	5.5
11.5 - 12.0	8.49	24.67				33.16	213	6.4
12.0 - 12.5	2.16	30.13	0.27			32.56	248	7.6
12.5 - 13.0	1.44	23.93	0.64			26.01	231	8.9
13.0 - 13.5	0.14	22.12	2.32			24.58	253	10.3
13.5 - 14.0		14.25	2.52			16.77	199	11.9
14.0 - 14.5		11.57	5.32			16.89	231	13.7
14.5 - 15.0		8.21	4.66			12.87	200	15.5
15.0 - 15.5		7.34	5.21	0.07		12.62	226	17.9
15.5 - 16.0		3.88	4.38	0.06		8.32	169	20.3
16.0 - 16.5		2.87	5.45	0.14		8.46	192	22.7
16.5 - 17.0		1.65	2.77	0.09		4.51	117	26.0
17.0 - 17.5		1.07	2.64			3.71	106	28.6
17.5 - 18.0		0.33	1.33			1.66	54	32.6
18.0 - 18.5		0.11	0.36			0.47	16	34.3
18.5 - 19.0		0.18	0.22			0.40	16	40.2
19.0 - 19.5		0.01	0.02			0.03	1	45.0
TSN (10^9)	514.88	200.19	38.11	0.36		753.54		
TSB (10^3 t)	1605	1897	720	7			4230	
Mean length (cm)	9.52	12.66	15.35	16.10		10.65		
Mean weight (g)	3.1	9.5	18.9	19.4				5.6
SSN (10^9)		37.22	32.36	0.36		69.94		
SSB (10^3 t)		657	664	7			1328	

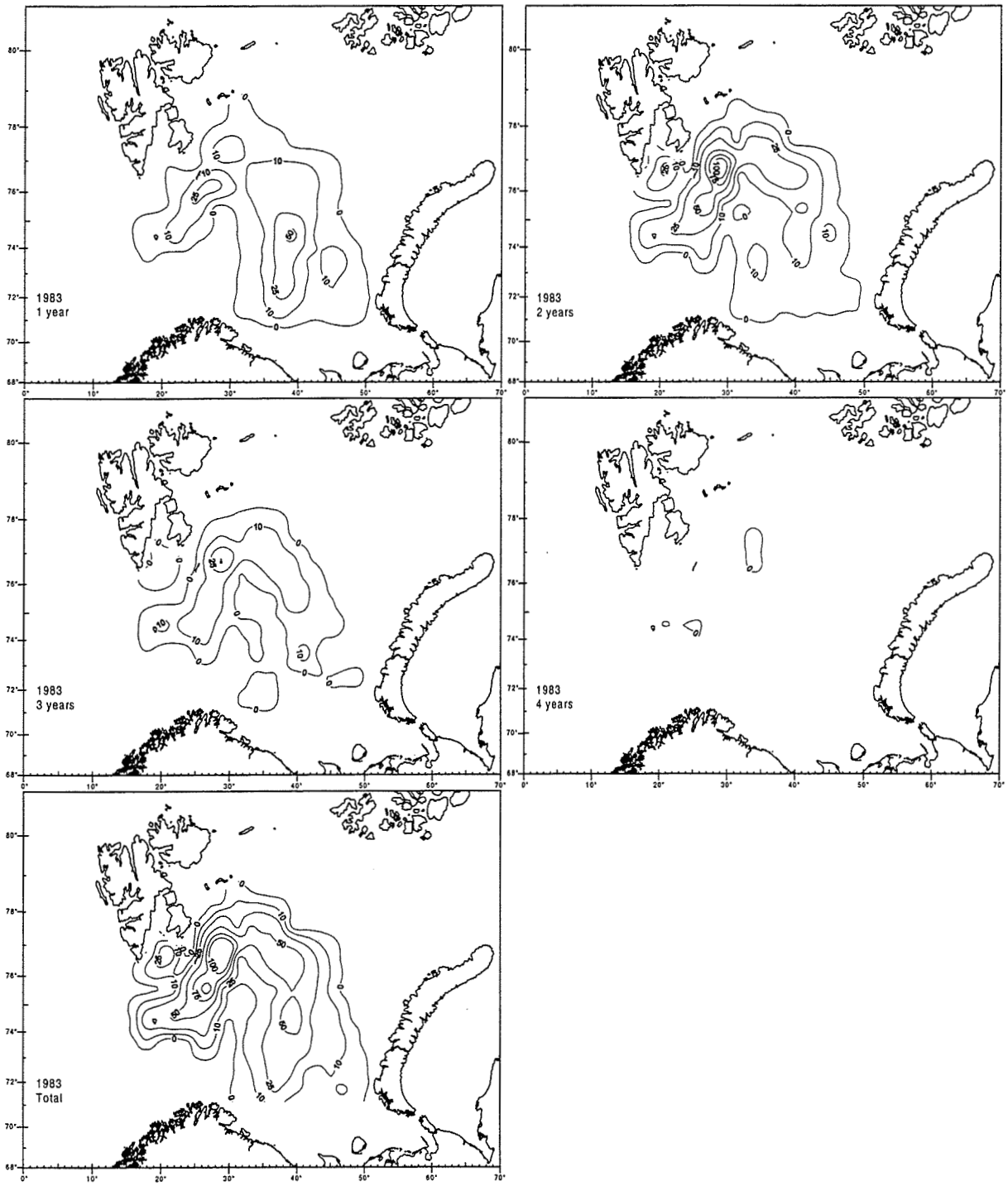

Figure 12. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1983.

Table 14. Acoustic abundance estimate of Barents Sea capelin in autumn 1984, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1983	**1982**	**1981**	**1980**	**1979**	**(10^9)**	**(10^3 t)**	**weight (g)**
7.5 - 8.0	1.62					1.62	3	1.6
8.0 - 8.5	3.60					3.60	7	1.9
8.5 - 9.0	11.20					11.20	23	2.1
9.0 - 9.5	28.26	0.34				28.60	76	2.7
9.5 - 10.0	39.38	3.89				43.27	136	3.2
10.0 - 10.5	26.12	13.79				39.91	158	3.9
10.5 - 11.0	21.77	24.34	0.25			46.36	209	4.5
11.0 - 11.5	13.25	29.45	0.79			43.49	229	5.3
11.5 - 12.0	5.58	30.08	1.14			36.80	223	6.0
12.0 - 12.5	1.37	26.93	1.94			30.24	215	7.1
12.5 - 13.0	1.58	17.40	1.63			20.61	173	8.4
13.0 - 13.5	0.75	13.83	2.84			17.42	171	9.8
13.5 - 14.0	0.25	7.39	4.09			11.73	134	11.4
14.0 - 14.5	0.02	5.40	5.01			10.43	141	13.5
14.5 - 15.0		3.79	4.95			8.74	129	14.8
15.0 - 15.5		3.08	5.39	0.36		8.83	153	17.3
15.5 - 16.0		2.17	4.20	0.37		6.74	128	19.0
16.0 - 16.5		1.85	4.06	0.39		6.30	137	21.7
16.5 - 17.0		1.01	3.05	0.59		4.65	117	25.2
17.0 - 17.5		1.05	3.27	0.31		4.63	131	28.4
17.5 - 18.0		0.57	2.33	0.23		3.13	100	31.8
18.0 - 18.5		0.16	1.54	0.23		1.93	69	35.6
18.5 - 19.0		0.12	0.79	0.32		1.23	47	38.5
19.0 - 19.5		0.01	0.60	0.14		0.75	32	42.8
19.5 - 20.0			0.29	0.09		0.38	18	46.9
20.0 - 20.5			0.02	0.07		0.09	5	53.1
20.5 - 21.0				0.02		0.02	1	60.0
TSN (10^9)	154.75	186.65	48.18	3.12		392.70		
TSB (10^3 t)	572	1432	877	84			2964	
Mean length (cm)	10.03	12.11	15.18	17.14		11.71		
Mean weight (g)	3.7	7.7	18.2	26.8				7.5
SSN (10^9)	0.02	19.21	35.50	3.12		57.85		
SSB (10^3 t)	0	348	771	84			1208	

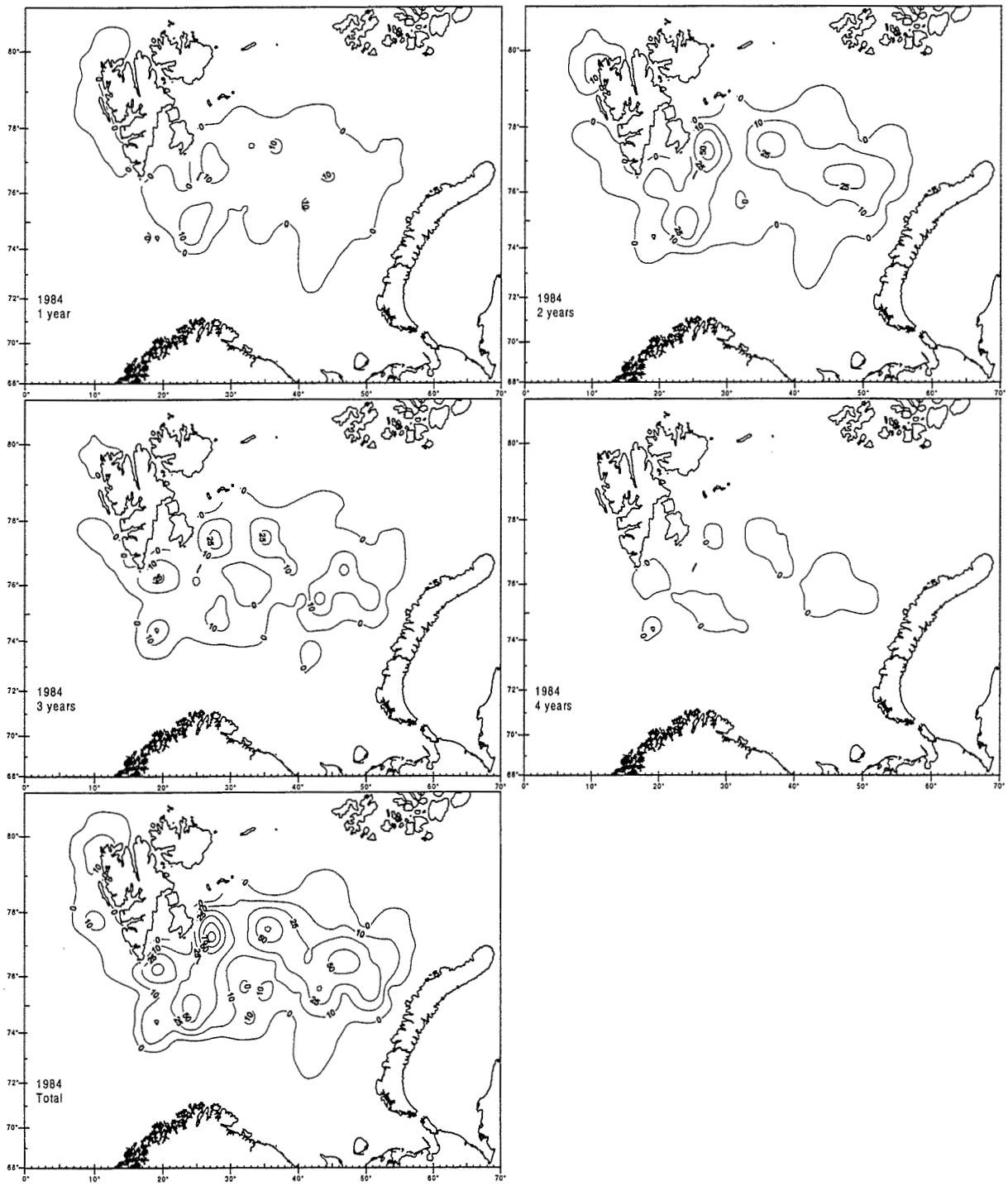

Figure 13. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1984.

Table 15. Acoustic abundance estimate of Barents Sea capelin in autumn 1985, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1984	**1983**	**1982**	**1981**	**1980**	**(10^9)**	**(10^3 t)**	**weight (g)**
7.0 - 7.5	0.04					0.04	0	1.0
7.5 - 8.0	0.03					0.03	0	1.2
8.0 - 8.5	0.33					0.33	1	1.8
8.5 - 9.0	1.34					1.34	3	2.5
9.0 - 9.5	3.93	0.01				3.94	11	2.7
9.5 - 10.0	6.66	0.52				7.18	26	3.5
10.0 - 10.5	8.94	1.66	0.06			10.66	44	4.1
10.5 - 11.0	9.54	3.64	0.04			13.22	64	4.8
11.0 - 11.5	4.78	6.27	0.25			11.30	63	5.6
11.5 - 12.0	1.55	6.56	0.57			8.68	58	6.6
12.0 - 12.5	0.87	8.92	1.15			10.94	83	7.6
12.5 - 13.0	0.49	6.51	1.83			8.83	77	8.7
13.0 - 13.5	0.18	5.25	2.37	0.01		7.81	78	10.0
13.5 - 14.0	0.01	2.98	2.84	0.02		5.85	67	11.4
14.0 - 14.5		2.52	3.73	0.16		6.41	82	12.8
14.5 - 15.0		1.42	2.54	0.15		4.11	60	14.5
15.0 - 15.5		0.98	2.46	0.22		3.66	59	16.1
15.5 - 16.0		0.37	1.28	0.20		1.85	33	17.7
16.0 - 16.5		0.41	0.79	0.06		1.26	25	19.7
16.5 - 17.0		0.12	0.45	0.08		0.65	15	22.5
17.0 - 17.5		0.13	0.23	0.01		0.37	9	23.9
17.5 - 18.0			0.08			0.08	2	27.8
18.0 - 18.5			0.04			0.04	1	32.0
TSN (10^9)	38.69	48.27	20.71	0.91		108.58		
TSB (10^3 t)	173	404	269	14			860	
Mean length (cm)	10.39	12.44	14.16	15.27		12.06		
Mean weight (g)	4.5	8.4	13.0	15.7				7.9
SSN (10^9)		5.95	11.60	0.88		18.43		
SSB (10^3 t)		89	182	15			286	

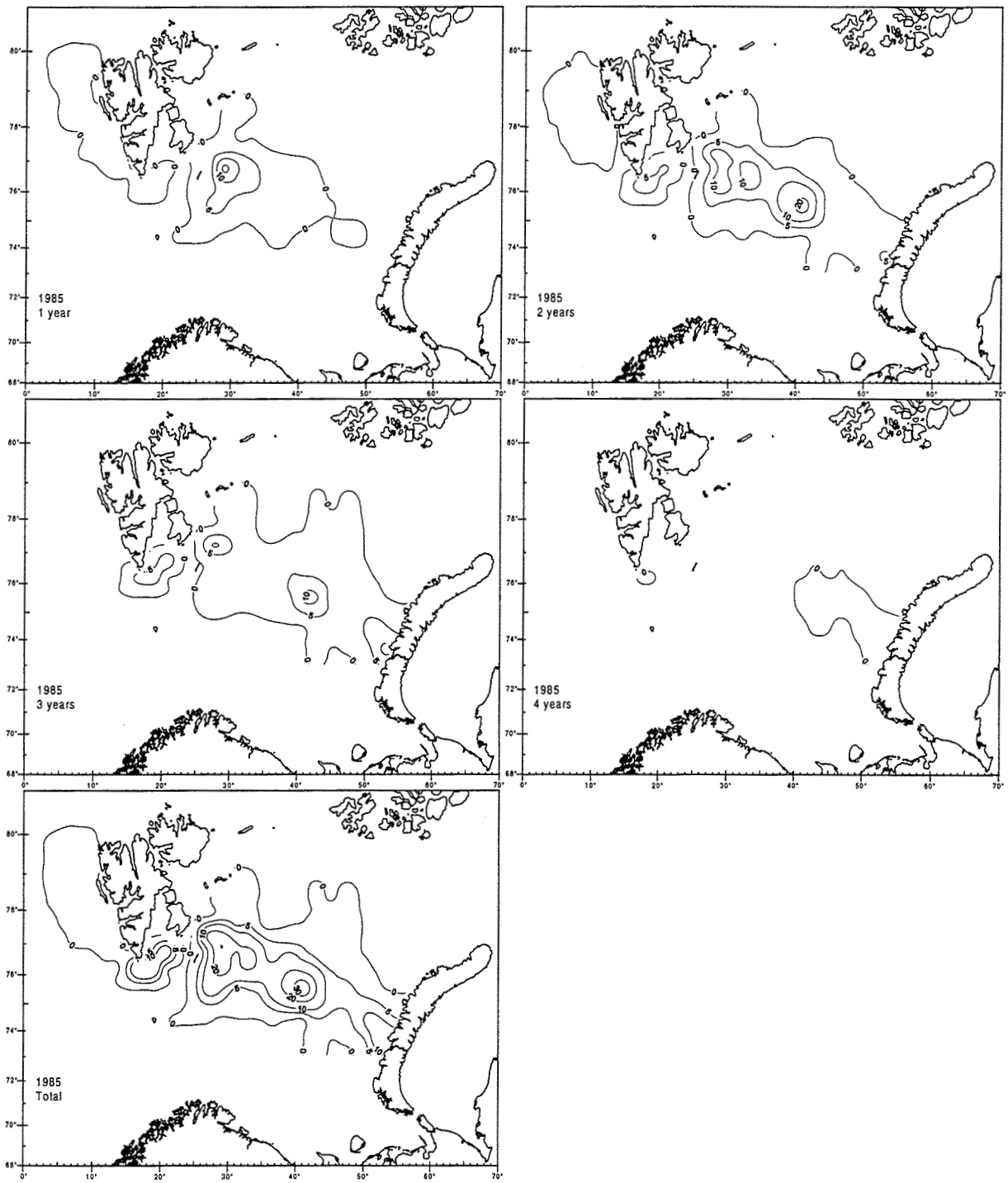

Figure 14. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1985.

Table 16. Acoustic abundance estimate of Barents Sea capelin in autumn 1986, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1985	1984	1983	1982	1981	(10^9)	(10^3 t)	weight (g)
7.0 - 7.5	0.34					0.34	0	1.0
7.5 - 8.0	0.19					0.19	0	1.0
8.0 - 8.5	0.24	0.02				0.26	0	1.3
8.5 - 9.0	0.47	0.01				0.48	1	1.8
9.0 - 9.5	0.37	0.03				0.39	1	2.2
9.5 - 10.0	0.64	0.01				0.65	2	2.8
10.0 - 10.5	0.97	0.01				0.98	4	3.6
10.5 - 11.0	1.32	0.09				1.41	6	4.5
11.0 - 11.5	0.45	0.85				1.29	7	5.1
11.5 - 12.0	0.74	0.34				1.08	7	6.3
12.0 - 12.5	0.19	0.19	0.29			0.67	5	7.7
12.5 - 13.0	0.08	0.44	0.11			0.64	6	8.8
13.0 - 13.5	0.03	0.48	0.18			0.69	7	9.5
13.5 - 14.0	0.01	0.59	0.36			0.96	10	10.6
14.0 - 14.5		0.51	0.51	0.01		1.02	13	12.5
14.5 - 15.0		0.46	0.56	0.05		1.06	15	13.9
15.0 - 15.5		0.36	0.66	0.12		1.14	18	15.6
15.5 - 16.0		0.26	0.41	0.05		0.72	13	17.3
16.0 - 16.5		0.05	0.22	0.02		0.29	6	19.1
16.5 - 17.0		0.01	0.05	0.02		0.08	2	21.0
17.0 - 17.5			0.00			0.00	0	25.0
17.5 - 18.0			0.00			0.00	0	27.0
TSN (10^9)	6.03	4.71	3.35	0.25		14.34		
TSB (10^3 t)	23	48	45	4			120	
Mean length (cm)	10.18	13.24	14.55	15.41		12.30		
Mean weight (g)	3.9	10.1	13.5	16.4				8.4
SSN (10^9)		1.66	2.41	0.25		4.32		
SSB (10^3 t)		24	37	4			65	

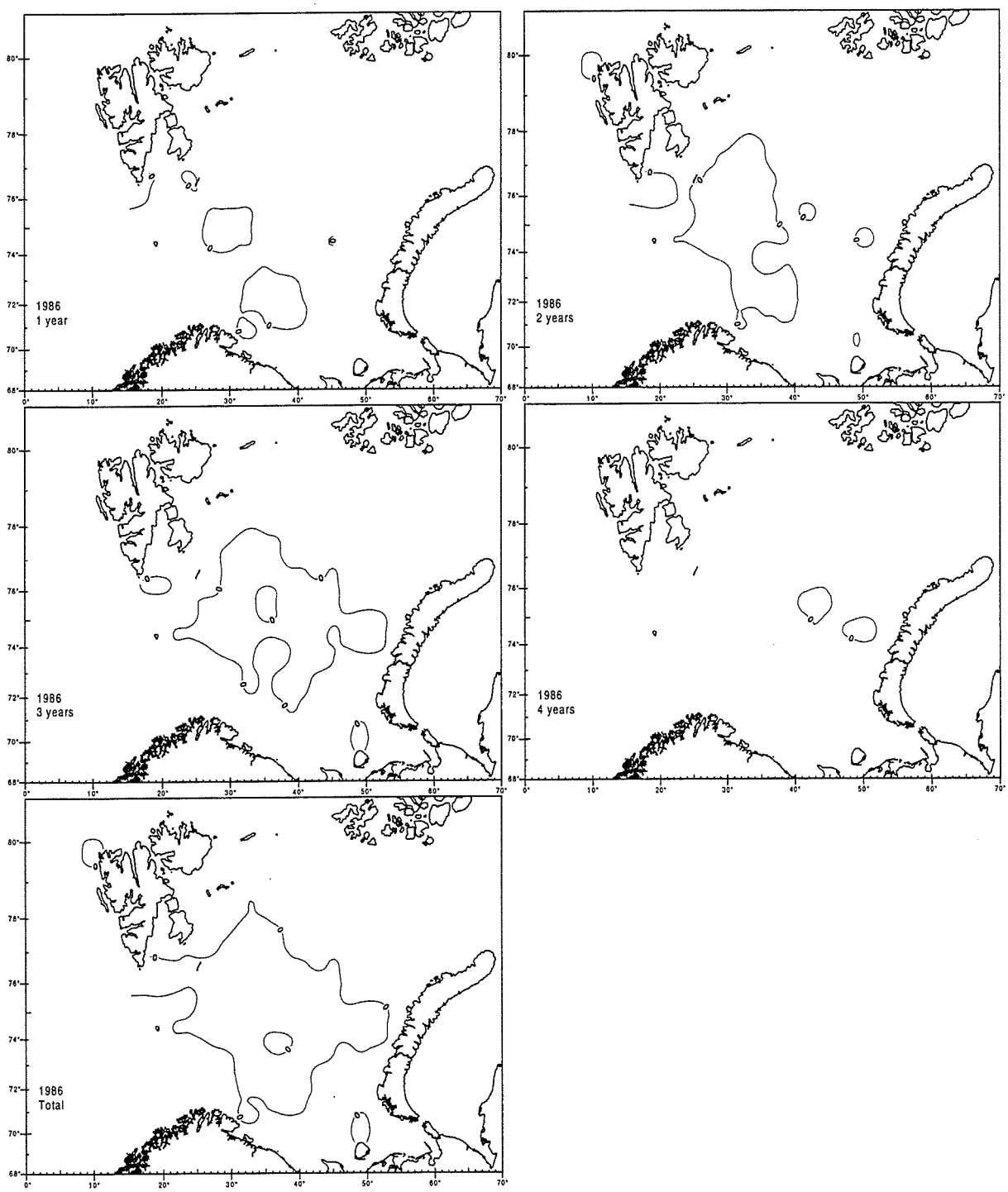

Figure 15. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1986.

Table 17. Acoustic abundance estimate of Barents Sea capelin in autumn 1987, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1986	**1985**	**1984**	**1983**	**1982**	**(10^9)**	**(10^3 t)**	**weight (g)**
6.0 - 6.5	2.22					2.22	2	1.0
6.5 - 7.0	3.63					3.63	4	1.0
7.0 - 7.5	3.30					3.30	3	1.0
7.5 - 8.0	3.19					3.19	4	1.1
8.0 - 8.5	5.31					5.31	9	1.6
8.5 - 9.0	7.52					7.52	16	2.1
9.0 - 9.5	5.41					5.41	13	2.4
9.5 - 10.0	3.15	0.02				3.18	10	3.1
10.0 - 10.5	1.35	0.02				1.37	5	3.5
10.5 - 11.0	1.10	0.01				1.10	5	4.3
11.0 - 11.5	0.48					0.48	2	4.9
11.5 - 12.0	0.43	0.01				0.43	3	5.7
12.0 - 12.5	0.26	0.03				0.29	2	6.5
12.5 - 13.0	0.15	0.09				0.24	2	8.0
13.0 - 13.5	0.06	0.16				0.23	2	9.3
13.5 - 14.0	0.02	0.27	0.02			0.30	3	10.6
14.0 - 14.5		0.42	0.02			0.44	5	12.2
14.5 - 15.0		0.40	0.02			0.42	6	14.0
15.0 - 15.5		0.18	0.03			0.22	3	15.7
15.5 - 16.0		0.09	0.01			0.10	2	17.4
16.0 - 16.5		0.01				0.01	0	18.4
16.5 - 17.0								
17.0 - 17.5								
17.5 - 18.0				0.01		0.01	0	34.0
TSN (10^9)	37.58	1.70	0.10	0.01		39.39		
TSB (10^3 t)	78	21	2	0			101	
Mean length (cm)	8.51	14.15	14.75	17.75		8.77		
Mean weight (g)	2.1	12.2	14.6	34.0				2.6
SSN (10^9)		1.10	0.08	0.01		1.19		
SSB (10^3 t)		15	1				17	

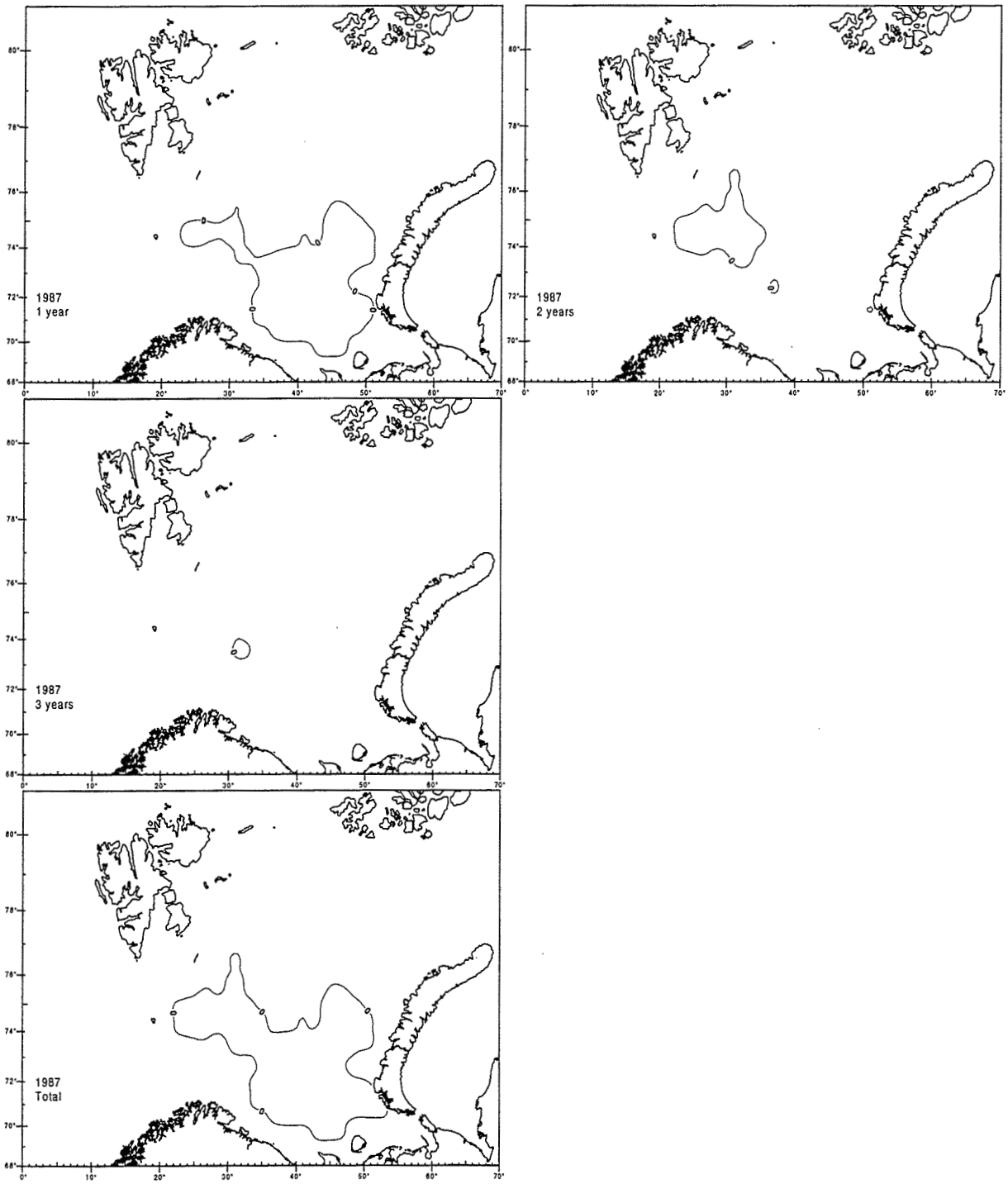

Figure 16. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1987.

Table 18. Acoustic abundance estimate of Barents Sea capelin in autumn 1988, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1987	1986	1985	1984	1983	(10^9)	(10^3 t)	weight (g)
6.5 - 7.0	0.04					0.04	0	1.0
7.0 - 7.5	0.24					0.24	0	1.0
7.5 - 8.0	0.74					0.74	1	1.1
8.0 - 8.5	1.49					1.49	3	2.1
8.5 - 9.0	3.16					3.16	8	2.5
9.0 - 9.5	4.17					4.17	12	2.9
9.5 - 10.0	3.99	0.11				4.09	14	3.4
10.0 - 10.5	2.52	0.09				2.62	10	4.0
10.5 - 11.0	2.40	0.35				2.75	13	4.6
11.0 - 11.5	1.32	0.38				1.71	9	5.3
11.5 - 12.0	0.69	1.33				2.02	13	6.5
12.0 - 12.5	0.13	1.99				2.12	16	7.4
12.5 - 13.0	0.05	4.26				4.32	37	8.6
13.0 - 13.5	0.05	3.79	0.02			3.87	38	9.7
13.5 - 14.0		4.58	0.05			4.64	53	11.5
14.0 - 14.5		3.46				3.46	46	13.2
14.5 - 15.0		2.96	0.02			2.97	46	15.3
15.0 - 15.5		2.44	0.03			2.47	44	17.7
15.5 - 16.0		1.46	0.09			1.55	30	19.6
16.0 - 16.5		0.82	0.03			0.85	19	22.1
16.5 - 17.0		0.32				0.32	8	24.6
17.0 - 17.5		0.26				0.27	7	26.2
17.5 - 18.0		0.04				0.04	1	30.4
18.0 - 18.5		0.02				0.02	1	31.0
TSN (10^9)	20.99	28.66	0.25			49.90		
TSB (10^3 t)	72	351	4				428	
Mean length (cm)	9.65	13.78	15.03			12.05		
Mean weight (g)	3.4	12.2	17.1					8.6
SSN (10^9)		11.77	0.17			11.94		
SSB (10^3 t)		197	3				201	

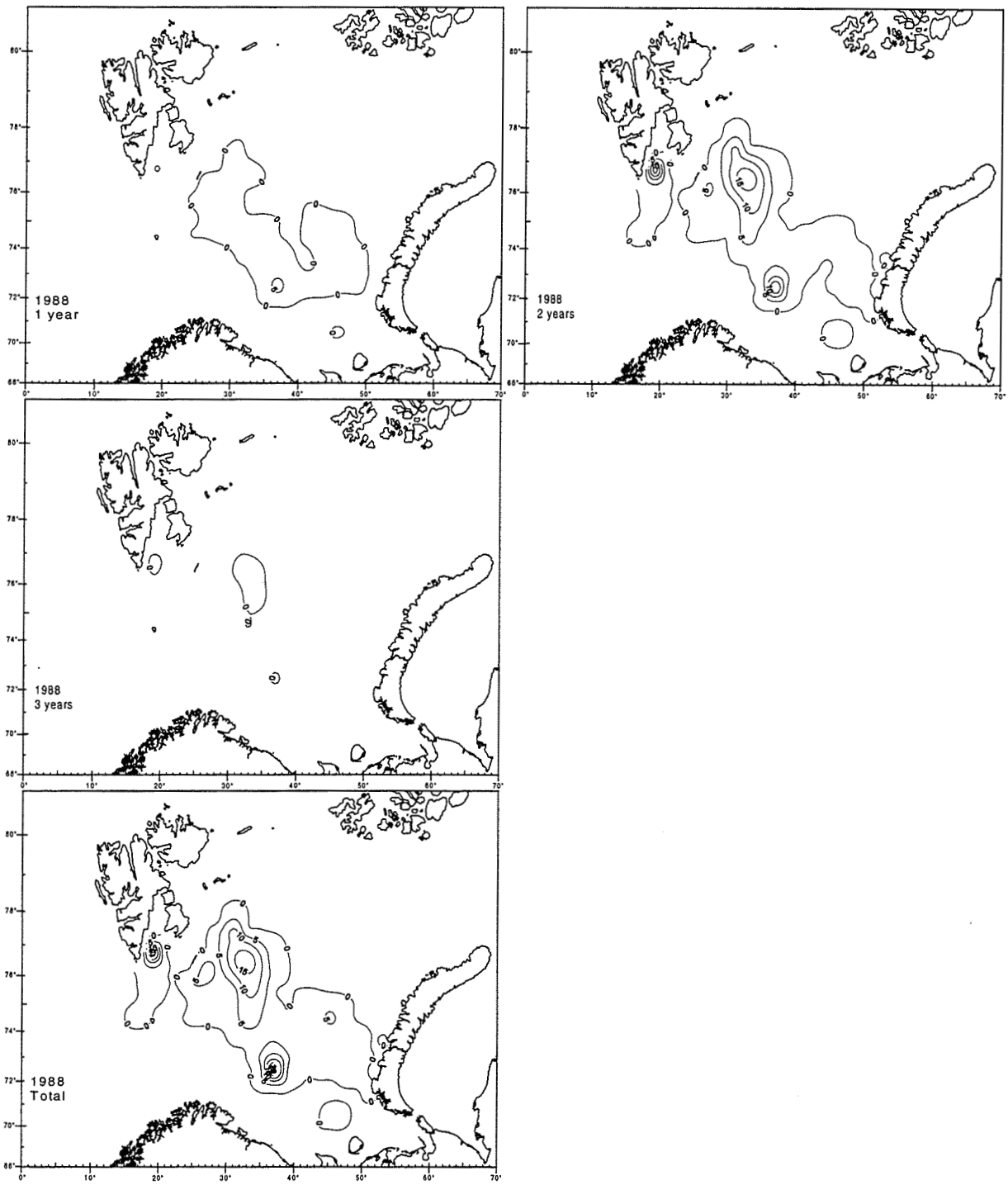

Figure 17. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1988.

Table 19. Acoustic abundance estimate of Barents Sea capelin in autumn 1989, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class					Sum	Biomass	Mean
	1	2	3	4	5+			
	1988	1987	1986	1985	1984	(10^9)	(10^3 t)	weight (g)
7.0 - 7.0	7.12					7.12	10	1.3
7.5 - 8.0	7.25					7.25	12	1.7
8.0 - 8.5	16.67					16.67	36	2.2
8.5 - 9.0	26.82					26.82	67	2.5
9.0 - 9.5	39.05					39.05	108	2.8
9.5 - 10.0	33.02					33.02	105	3.2
10.0 - 10.5	24.66	0.26				24.92	94	3.8
10.5 - 11.0	16.05	0.17				16.22	69	4.2
11.0 - 11.5	7.80	0.95				8.75	44	5.1
11.5 - 12.0	4.86	0.37				5.23	32	6.1
12.0 - 12.5	2.99	1.13				4.12	28	6.8
12.5 - 13.0	1.70	1.05				2.75	23	8.2
13.0 - 13.5	0.93	2.61				3.54	33	9.2
13.5 - 14.0	0.13	3.12				3.25	32	10.0
14.0 - 14.5	0.09	3.09				3.18	37	11.6
14.5 - 15.0	0.04	1.79	0.39			2.22	29	12.8
15.0 - 15.5	0.02	1.18	0.68			1.88	28	14.7
15.5 - 16.0		0.68	0.34			1.02	18	17.6
16.0 - 16.5		0.39	0.31			0.70	15	21.8
16.5 - 17.0		0.39	0.46	0.02		0.87	20	22.4
17.0 - 17.5		0.34	0.08			0.42	12	28.1
17.5 - 18.0		0.14	0.16			0.30	9	30.9
18.0 - 18.5		0.05	0.08			0.13	5	34.4
18.5 - 19.0		0.02	0.04			0.06	2	40.0
TSN (10^9)	189.20	17.73	2.54	0.02		209.49		
TSB (10^3 t)	614	204	46	0			865	
Mean length (cm)	9.56	13.87	16.00	16.75		10.00		
Mean weight (g)	3.2	11.5	18.1	21				4.1
SSN (10^9)	0.15	8.07	2.54	0.02		10.78		
SSB (10^3 t)	2	122	50				174	

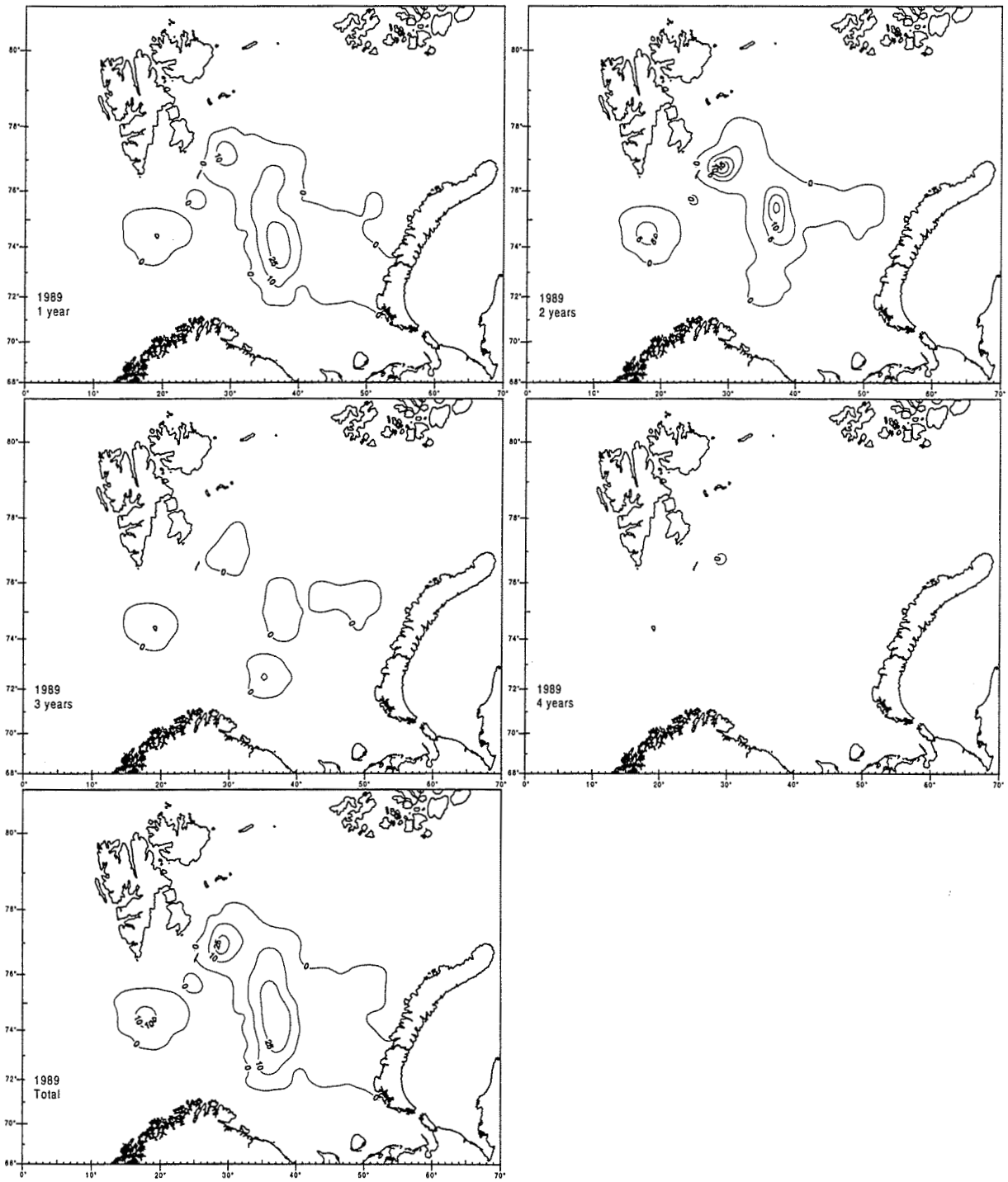

Figure 18. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1989.

Table 20. Acoustic abundance estimate of Barents Sea capelin in autumn 1990, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1989	1988	1987	1986	1985	(10^9)	(10^3 t)	weight (g)
7.0 - 7.5	3.56					3.56	4	1.1
7.5 - 8.0	11.84					11.84	25	2.1
8.0 - 8.5	51.09					51.09	102	2.0
8.5 - 9.0	91.12					91.12	210	2.3
9.0 - 9.5	102.38					102.38	279	2.7
9.5 - 10.0	102.78					102.78	325	3.2
10.0 - 10.5	101.15					101.15	384	3.8
10.5 - 11.0	80.73	0.14				80.87	353	4.4
11.0 - 11.5	68.64	2.91				71.55	367	5.1
11.5 - 12.0	42.14	6.36				48.50	294	6.1
12.0 - 12.5	24.68	10.43				35.11	258	7.4
12.5 - 13.0	11.72	9.77				21.49	184	8.6
13.0 - 13.5	3.10	15.84				18.94	191	10.1
13.5 - 14.0	3.45	17.25				20.70	239	11.5
14.0 - 14.5	1.75	20.54				22.29	293	13.1
14.5 - 15.0	0.15	19.83	0.10			20.08	300	15.0
15.0 - 15.5	0.09	22.81				22.90	392	17.1
15.5 - 16.0		16.88	1.65			18.53	365	19.7
16.0 - 16.5		17.52	2.15	0.12		19.79	439	22.2
16.5 - 17.0		10.11	2.18			12.29	301	24.5
17.0 - 17.5		4.35	4.61			8.96	249	27.8
17.5 - 18.0		1.69	3.27			4.96	155	31.3
18.0 - 18.5		1.15	1.61			2.76	97	35.3
18.5 - 19.0			0.60			0.60	23	37.6
19.0 - 19.5			0.06			0.06	2	40.0
TSN (10^9)	700.37	177.58	16.23	0.12		894.30		
TSB (10^3 t)	2663	2724	441	2			5831	
Mean length (cm)	10.03	14.57	17.15	16.25		11.06		
Mean weight (g)	3.8	15.3	27.2	20.0				6.5
SSN (10^9)	1.99	114.88	16.23	0.12		133.22		
SSB (10^3 t)	27	2140	447	2			2617	

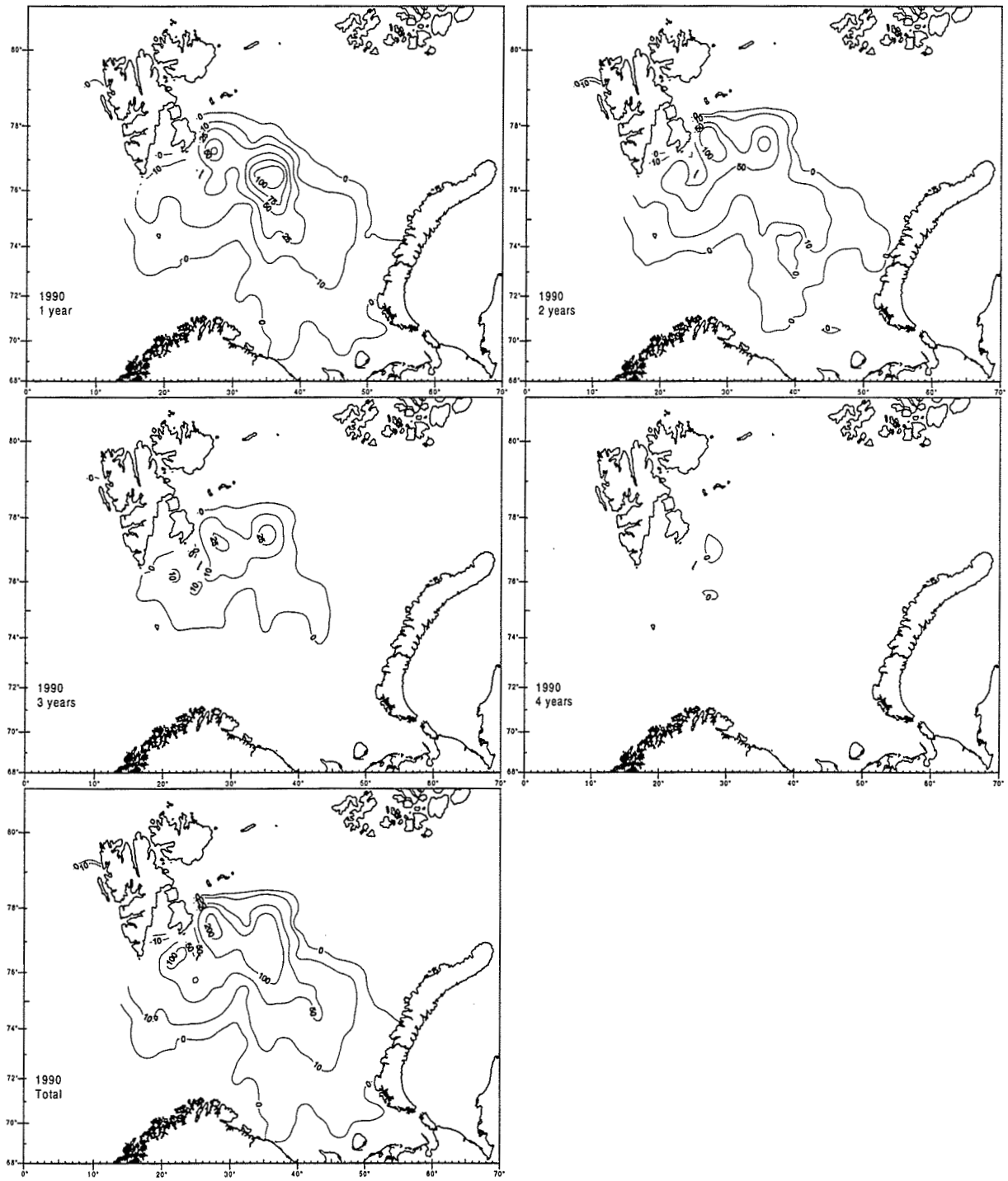

Figure 19. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1990.

Table 21. Acoustic abundance estimate of Barents Sea capelin in autumn 1991, based on *TS* = 19.1 *log L -74.0.* TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1990	1989	1988	1987	1986	(10^9)	(10^3 t)	weight (g)
7.0 - 7.5	3.22	0.07				3.29	3	1.0
7.5 - 8.0	5.63					5.63	9	1.6
8.0 - 8.5	16.56	0.47				17.03	33	1.9
8.5 - 9.0	29.38	0.41				29.79	65	2.2
9.0 - 9.5	47.19	1.42				48.61	147	3.0
9.5 - 10.0	97.60	4.61				102.21	345	3.4
10.0 - 10.5	96.87	20.46				117.33	473	4.0
10.5 - 11.0	63.09	46.13				109.22	514	4.7
11.0 - 11.5	23.03	88.23				111.26	604	5.4
11.5 - 12.0	11.01	92.38	0.35			103.74	665	6.4
12.0 - 12.5	5.04	77.61				82.65	621	7.5
12.5 - 13.0	1.43	63.54	0.66			65.63	569	8.7
13.0 - 13.5	1.28	48.11	0.45			49.84	504	10.1
13.5 - 14.0	0.51	39.73	1.89			42.13	488	11.6
14.0 - 14.5	0.25	33.38	2.82			36.45	482	13.2
14.5 - 15.0		23.77	3.58			27.35	414	15.1
15.0 - 15.5		17.64	5.64	0.05		23.33	403	17.3
15.5 - 16.0		8.92	5.01	0.24		14.17	271	19.1
16.0 - 16.5		6.49	4.26	0.08		10.83	236	21.8
16.5 - 17.0		3.24	3.89			7.13	178	24.9
17.0 - 17.5		2.05	2.14	0.04		4.23	118	27.9
17.5 - 18.0		0.93	1.64	0.17		2.74	83	30.4
18.0 - 18.5		0.35	0.30	0.57		1.22	43	35.2
18.5 - 19.0		0.17	0.23	0.04		0.44	17	38.3
19.0 - 19.5		0.08	0.02			0.10	4	43.8
19.5 - 20.0			0.01			0.01	0	45.0
TSN (10^9)	402.09	580.19	32.89	1.19		1016.36		
TSB (10^3 t)	1516	5098	637	36			7287	
Mean length (cm)	9.99	12.50	15.60	17.40		11.61		
Mean weight (g)	3.8	8.8	19.4	30.2				7.2
SSN (10^9)	0.25	97.02	29.54	1.19		128.00		
SSB (10^3 t)	3	1605	605	36			2249	

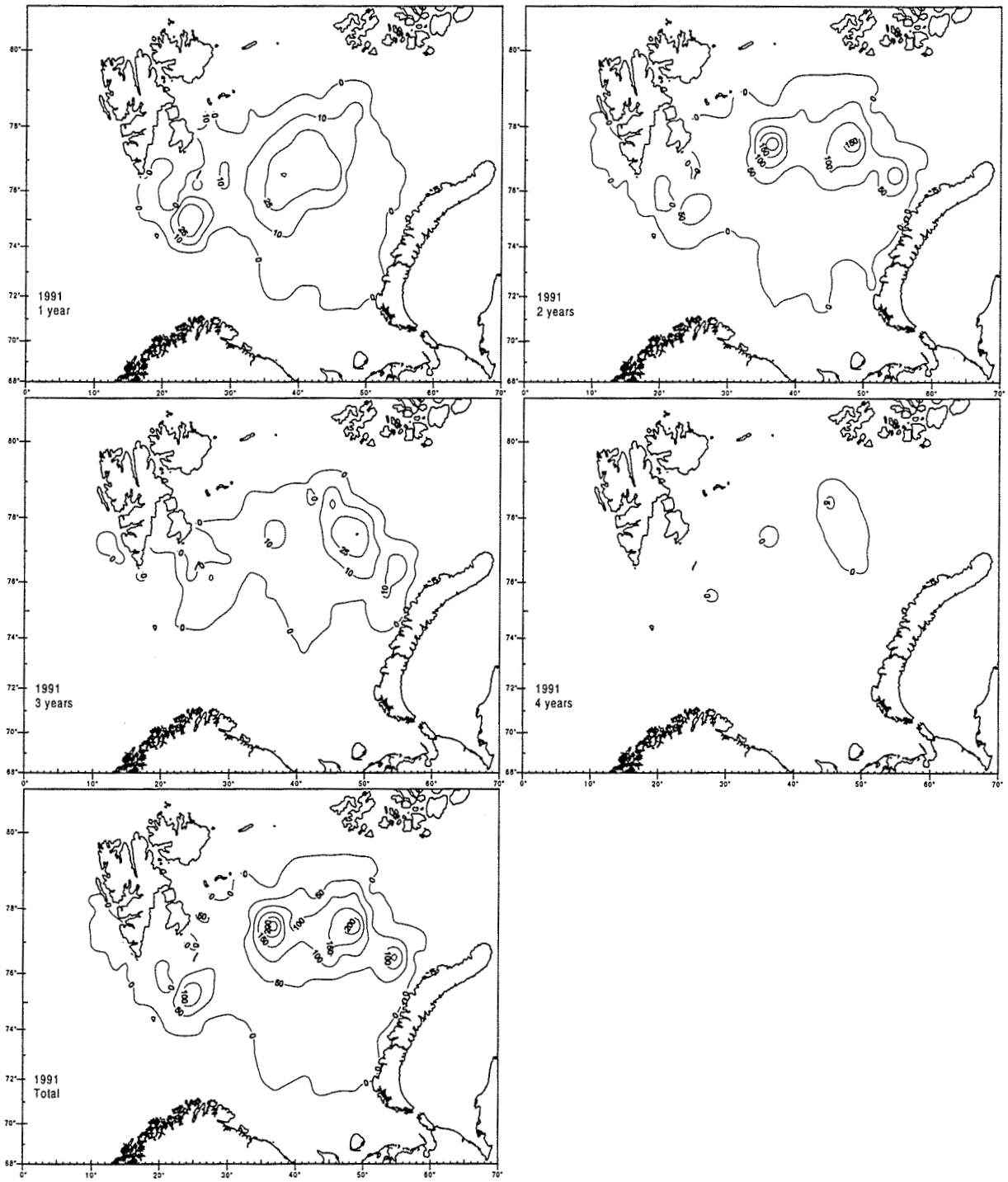

Figure 20. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1991.

Table 22. Acoustic abundance estimate of Barents Sea capelin in autumn 1992, based on *TS = 19.1 log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1991	1990	1989	1988	1987	(10^9)	(10^3 t)	weight (g)
7.0 - 7.5	3.79					3.79	6	1.5
7.5 - 8.0	8.83					8.83	18	2.1
8.0 - 8.5	13.44					13.44	31	2.3
8.5 - 9.0	34.04					34.04	89	2.6
9.0 - 9.5	69.18					69.18	214	3.1
9.5 - 10.0	91.60					91.60	309	3.4
10.0 - 10.5	61.06	1.98				63.04	248	3.9
10.5 - 11.0	47.90	7.45	0.22			55.57	254	4.6
11.0 - 11.5	15.37	25.82	0.23			41.42	227	5.5
11.5 - 12.0	4.01	34.66	0.97			39.64	254	6.4
12.0 - 12.5	1.98	31.18	3.51			36.67	274	7.5
12.5 - 13.0	0.09	28.48	6.12			34.69	299	8.6
13.0 - 13.5		24.67	8.83			33.50	334	10.0
13.5 - 14.0		18.04	13.77			31.81	367	11.5
14.0 - 14.5		12.39	16.54			28.93	386	13.3
14.5 - 15.0		6.97	16.59			23.56	351	14.9
15.0 - 15.5		2.91	17.71			20.62	365	17.7
15.5 - 16.0		1.11	14.19	0.05		15.35	311	20.3
16.0 - 16.5		0.54	14.56	0.25		15.35	352	23.0
16.5 - 17.0		0.06	8.60	0.16		8.82	225	25.6
17.0 - 17.5			4.69	0.40		5.09	148	29.0
17.5 - 18.0			1.60	0.23		1.83	57	31.1
18.0 - 18.5			0.43	0.23		0.66	23	35.2
18.5 - 19.0			0.26			0.26	9	35.9
TSN (10^9)	351.29	196.26	128.82	1.32		677.69		
TSB (10^3 t)	1249	1691	2172	39			5150	
Mean length (cm)	9.75	12.58	14.91	17.20		11.56		
Mean weight (g)	3.6	8.6	16.9	29.5				7.6
SSN (10^9)		23.98	95.17	1.32		120.47		
SSB (10^3 t)		357	1834	39			2228	

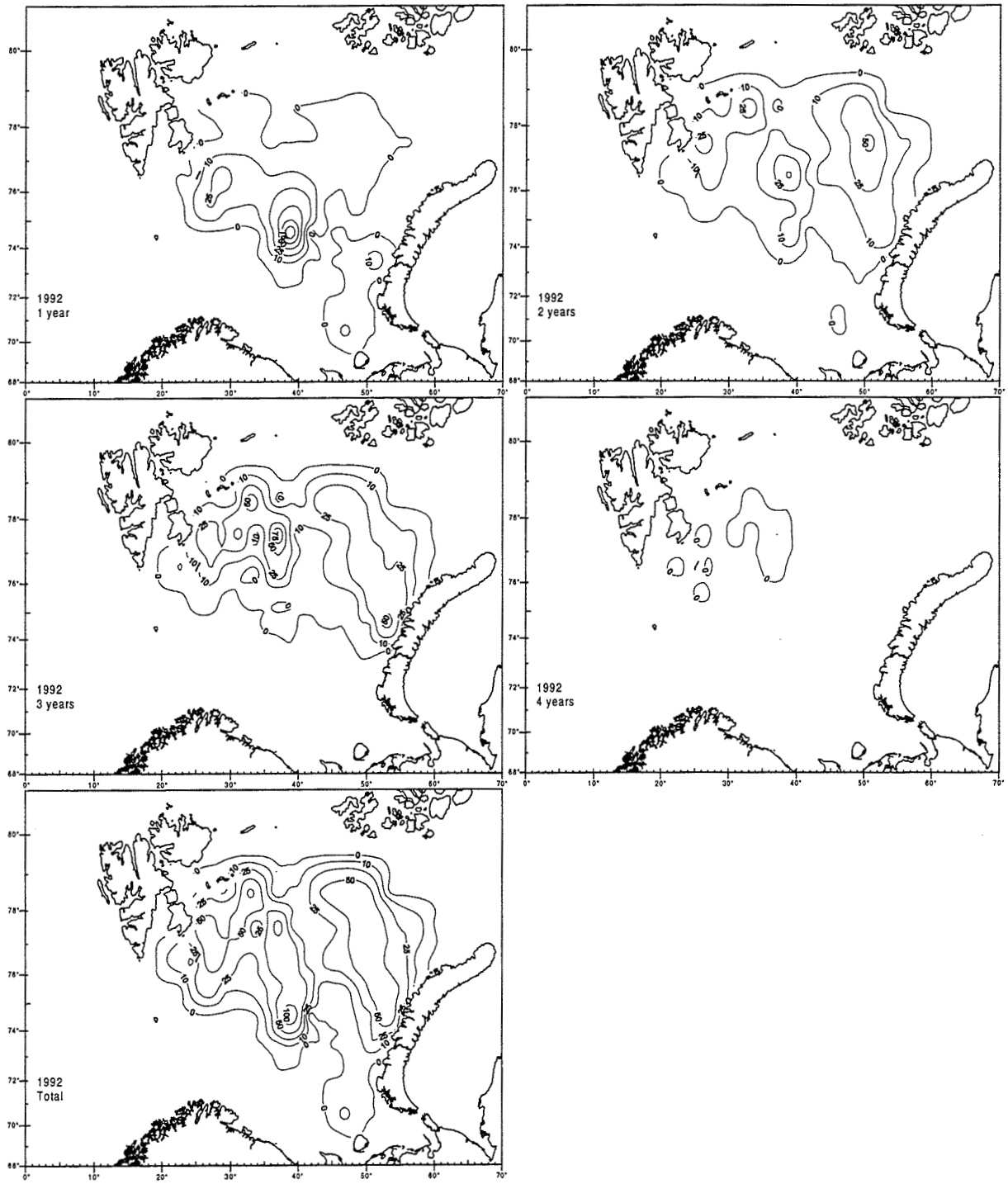

Figure 21. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1992.

Table 23. Acoustic abundance estimate of Barents Sea capelin in autumn 1993, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1992	1991	1990	1989	1988	(10^9)	(10^3 t)	weight (g)
7.0 - 7.5	0.05					0.05	0	1.1
7.5 - 8.0	0.09					0.09	0	1.6
8.0 - 8.5	0.08	0.01				0.09	0	1.9
8.5 - 9.0	0.30	0.01				0.32	1	2.3
9.0 - 9.5	0.50	0.04				0.54	2	2.9
9.5 - 10.0	0.52	0.08				0.60	2	3.3
10.0 - 10.5	0.38	0.37				0.74	3	4.0
10.5 - 11.0	0.18	0.80				0.99	5	4.8
11.0 - 11.5	0.02	2.64				2.66	15	5.5
11.5 - 12.0	0.04	5.85	0.04			5.93	39	6.5
12.0 - 12.5	0.06	10.31	0.32			10.69	80	7.5
12.5 - 13.0	0.01	11.60	0.75			12.36	105	8.5
13.0 - 13.5	0.00	10.21	1.36	0.02		11.59	116	10.0
13.5 - 14.0		5.87	2.58	0.18		8.63	100	11.6
14.0 - 14.5		3.21	2.82	0.37		6.40	87	13.6
14.5 - 15.0		1.64	3.75	0.44		5.82	90	15.5
15.0 - 15.5		0.53	2.63	0.38		3.54	61	17.1
15.5 - 16.0		0.14	1.40	0.26		1.80	35	19.5
16.0 - 16.5		0.03	0.99	0.23		1.25	27	21.6
16.5 - 17.0		0.04	0.52	0.29		0.84	20	23.4
17.0 - 17.5			0.07	0.10		0.17	5	26.6
17.5 - 18.0			0.07	0.01		0.08	2	27.1
18.0 - 18.5				0.13		0.13	4	32.0
TSN (10^9)	2.24	53.38	17.27	2.40		75.28		
TSB (10^3 t)	8	482	261	45			796	
Mean length (cm)	9.61	12.81	14.59	15.46		13.21		
Mean weight (g)	3.4	9.0	15.1	18.8				10.6
SSN (10^9)		5.58	12.23	2.20		20.02		
SSB (10^3 t)		82	206	42			330	

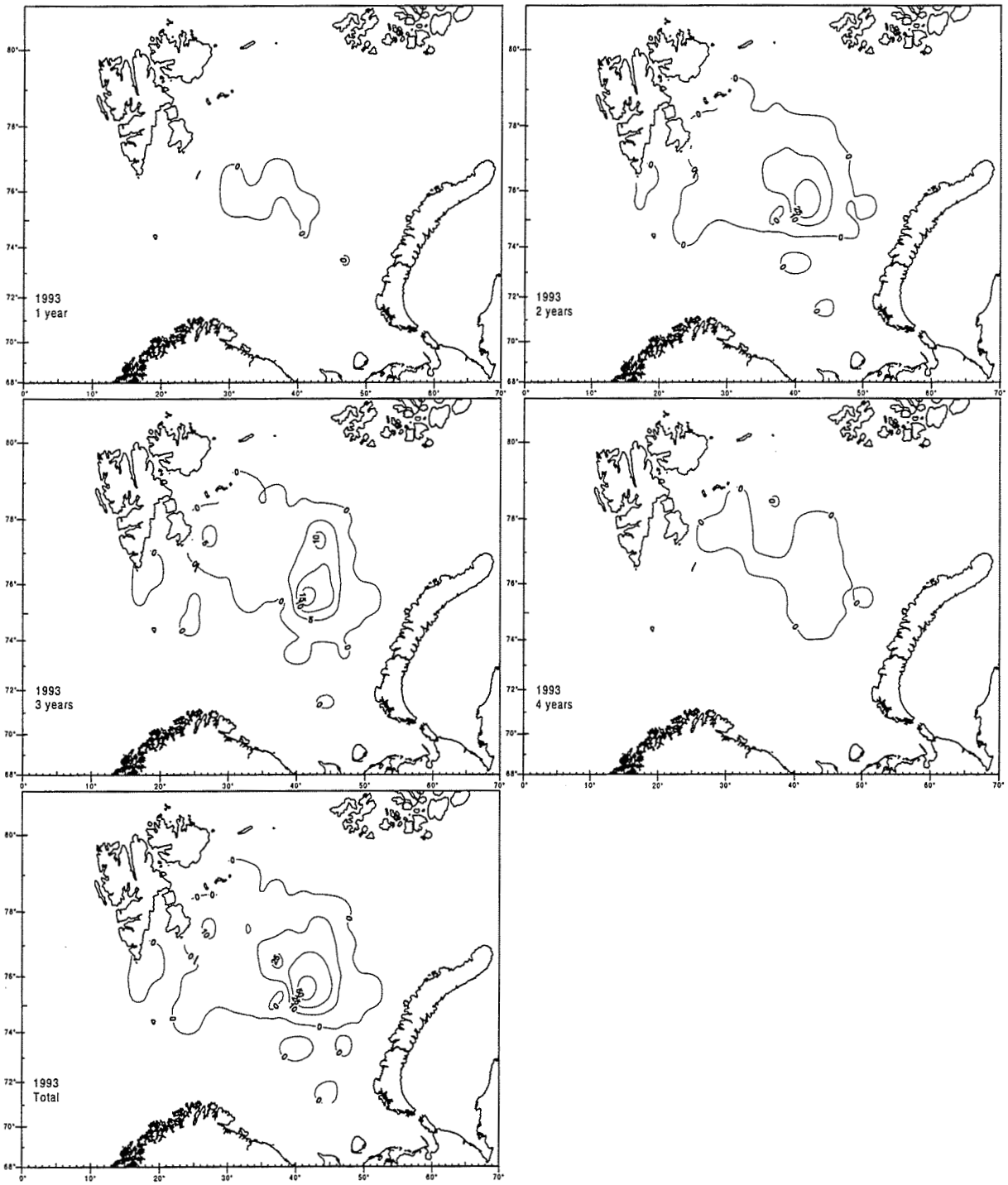

Figure 22. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1993.

Table 24. Acoustic abundance estimate of Barents Sea capelin in autumn 1994, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1993	1992	1991	1990	1989	(10^9)	(10^3 t)	weight (g)
7.0 - 7.5	0.13					0.13	0	1.0
7.5 - 8.0	1.04					1.04	2	1.6
8.0 - 8.5	2.73					2.73	5	1.9
8.5 - 9.0	2.70	0.12				2.82	6	2.1
9.0 - 9.5	2.29	0.07				2.36	7	2.9
9.5 - 10.0	1.03	0.00				1.03	4	3.5
10.0 - 10.5	1.87	0.05				1.92	8	4.2
10.5 - 11.0	1.21	0.08				1.29	7	5.1
11.0 - 11.5	2.28	0.23				2.51	15	5.9
11.5 - 12.0	1.80	0.41	0.04			2.25	15	6.8
12.0 - 12.5	1.46	0.34	0.15			1.94	15	7.8
12.5 - 13.0	0.52	0.25	0.14			0.92	8	9.1
13.0 - 13.5	0.31	0.18	0.08			0.57	6	10.7
13.5 - 14.0	0.20	0.21	0.17	0.02		0.60	7	11.8
14.0 - 14.5	0.13	0.49	0.49	0.03		1.14	15	13.2
14.5 - 15.0	0.04	0.40	0.83	0.00		1.27	19	15.2
15.0 - 15.5	0.02	0.35	0.89	0.02		1.29	22	17.2
15.5 - 16.0		0.18	0.83	0.04		1.04	20	19.1
16.0 - 16.5		0.05	0.43	0.03		0.51	11	21.6
16.5 - 17.0		0.02	0.22	0.02		0.26	6	23.5
17.0 - 17.5			0.03	0.01		0.04	1	26.6
TSN (10^9)	19.76	3.43	4.30	0.17		27.65		
TSB (10^3 t)	87	39	71	3			199	
Mean length (cm)	10.09	13.21	15.01	15.42		11.28		
Mean weight (g)	4.4	11.2	16.5	18.4				7.2
SSN (10^9)	0.20	1.49	3.71	0.15		5.54		
SSB (10^3 t)	3	24	65	3			94	

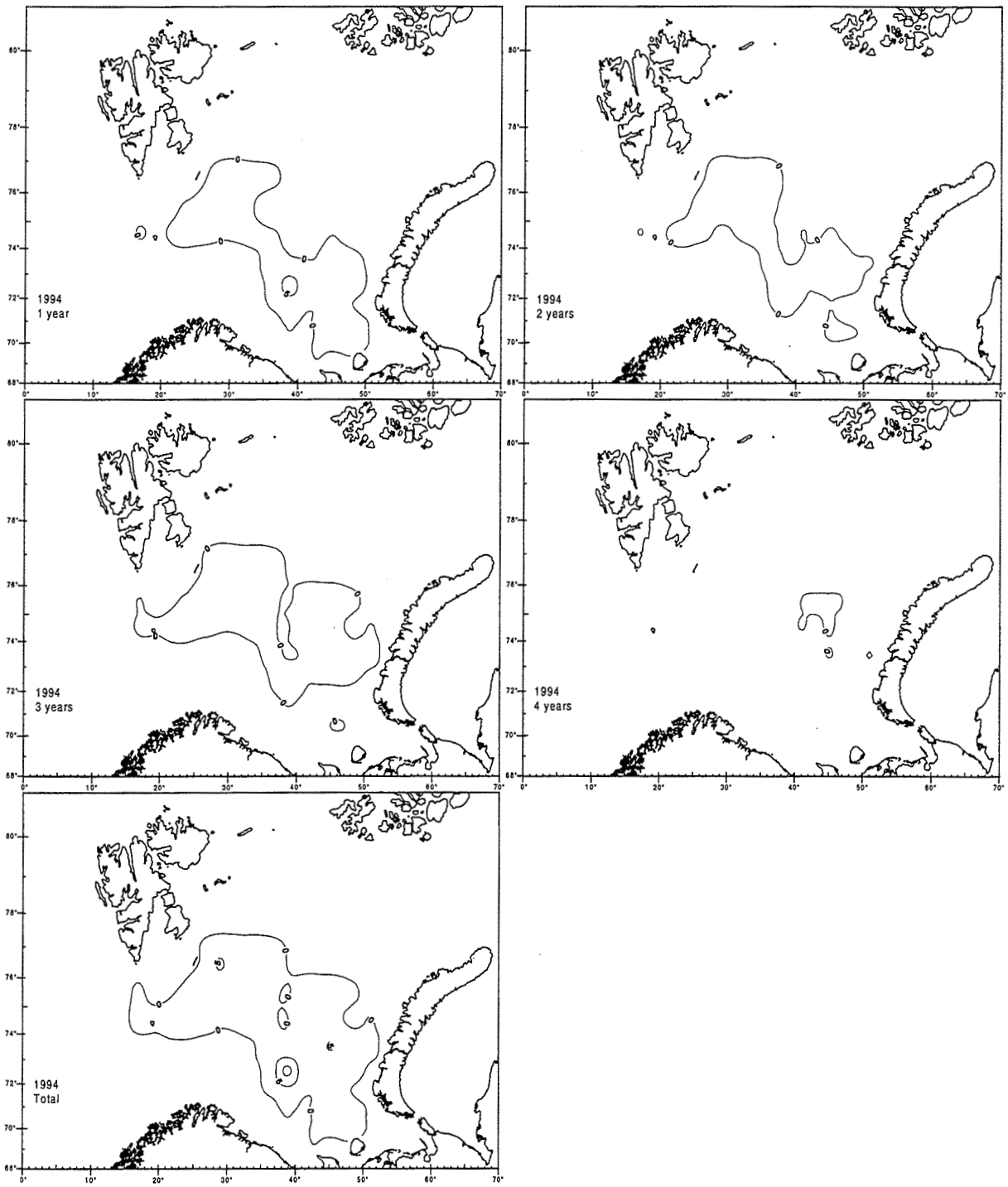

Figure 23. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1994.

Table 25. Acoustic abundance estimate of Barents Sea capelin in autumn 1995, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1994	1993	1992	1991	1990	(10^9)	(10^3 t)	weight (g)
7.5 - 8.0	0.03					0.03	0	2.0
8.0 - 8.5	0.04					0.04	0	2.0
8.5 - 9.0	0.02	0.00				0.02	0	2.1
9.0 - 9.5	0.13	0.00				0.13	0	3.0
9.5 - 10.0	0.32					0.32	1	3.3
10.0 - 10.5	0.74	0.00				0.74	3	4.1
10.5 - 11.0	1.12	0.14				1.26	6	4.8
11.0 - 11.5	1.27	0.31				1.57	9	5.6
11.5 - 12.0	0.78	0.33				1.10	7	6.7
12.0 - 12.5	0.76	0.53	0.01			1.30	10	7.6
12.5 - 13.0	0.76	0.60	0.02			1.38	12	8.8
13.0 - 13.5	0.56	0.68	0.06			1.30	13	10.0
13.5 - 14.0	0.34	0.80	0.04			1.18	13	11.3
14.0 - 14.5	0.19	1.02	0.23			1.44	19	13.0
14.5 - 15.0	0.07	0.96	0.25	0.00		1.29	19	14.7
15.0 - 15.5		0.87	0.38	0.02		1.27	21	16.5
15.5 - 16.0		0.68	0.26	0.05		0.99	18	18.5
16.0 - 16.5		0.52	0.17	0.05		0.74	15	20.7
16.5 - 17.0		0.45	0.06	0.10		0.61	14	23.2
17.0 - 17.5		0.17	0.05	0.06		0.28	7	26.1
17.5 - 18.0		0.07	0.02	0.07		0.15	4	28.0
18.0 - 18.5		0.02				0.02	1	28.5
TSN (10^9)	7.13	8.14	1.53	0.35		17.16		
TSB (10^3 t)	47	112	26	8			194	
Mean length (cm)	11.64	14.26	15.21	16.68		13.31		
Mean weight (g)	6.7	13.8	16.8	22.6				11.3
SSN (10^9)	0.26	4.77	1.41	0.35		6.79		
SSB (10^3 t)	3	82	24	8			118	

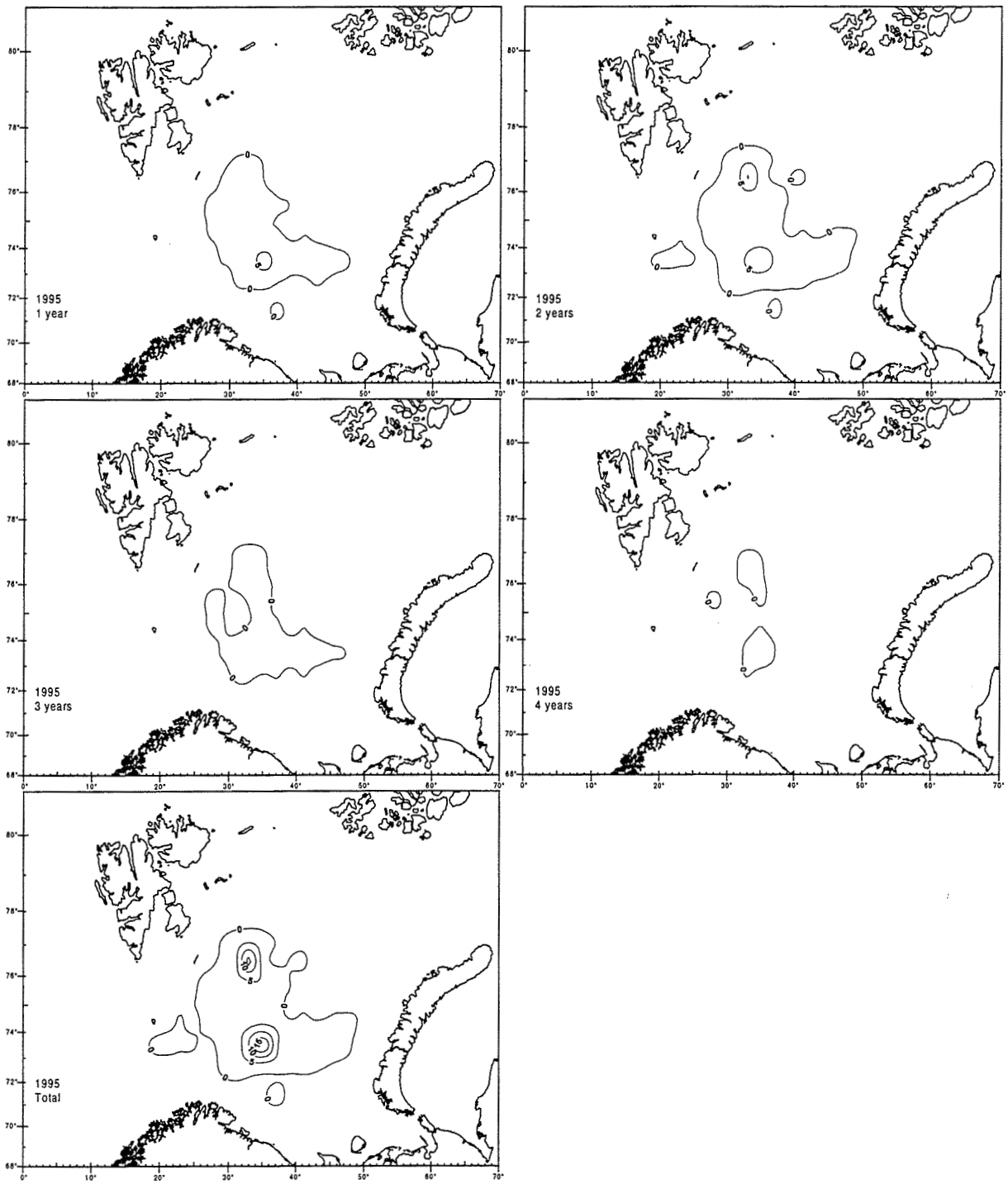

Figure 24. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1995.

Table 26. Acoustic abundance estimate of Barents Sea capelin in autumn 1996, based on *TS* = 19.1 *log L -74.0*. TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1995	1994	1993	1992	1991	(10^9)	(10^3 t)	weight (g)
6.5 - 7.0	9.26					9.26	9	1.0
7.0 - 7.5	6.11					6.11	6	1.0
7.5 - 8.0	7.13					7.13	9	1.2
8.0 - 8.5	8.52					8.52	15	1.8
8.5 - 9.0	9.91					9.91	21	2.1
9.0 - 9.5	9.87	0.07				9.94	27	2.7
9.5 - 10.0	7.02					7.02	22	3.1
10.0 - 10.5	7.05	0.13				7.18	27	3.7
10.5 - 11.0	5.79	0.14				5.93	27	4.5
11.0 - 11.5	4.60	0.08				4.67	26	5.5
11.5 - 12.0	3.18	0.24				3.42	22	6.5
12.0 - 12.5	1.45	0.16				1.61	12	7.6
12.5 - 13.0	1.03	0.37	0.02			1.42	12	8.7
13.0 - 13.5	0.62	0.32	0.02			0.96	9	9.6
13.5 - 14.0	0.25	0.59	0.07			0.90	10	11.1
14.0 - 14.5	0.11	0.71	0.01			0.83	11	12.7
14.5 - 15.0	0.01	1.06	0.07			1.13	16	14.4
15.0 - 15.5		1.20	0.22			1.42	23	16.5
15.5 - 16.0		1.29	0.21	0.01		1.51	28	18.3
16.0 - 16.5		1.51	0.28	0.00		1.79	38	21.4
16.5 - 17.0		1.70	0.29	0.01		1.99	47	23.8
17.0 - 17.5		1.12	0.38	0.02		1.52	40	26.4
17.5 - 18.0		0.55	0.21			0.75	22	29.6
18.0 - 18.5		0.24	0.19	0.02		0.45	15	34.2
18.5 - 19.0		0.04	0.08			0.13	5	37.9
19.0 - 19.5		0.03	0.03			0.06	2	36.4
TSN (10^9)	81.91	11.53	2.07	0.07		95.58		
TSB (10^3 t)	237	215	50	2			503	
Mean length (cm)	9.12	15.45	16.62	17.16		10.05		
Mean weight (g)	2.9	18.6	23.9	25.5				
SSN (10^9)	0.12	9.43	1.97	0.07		11.59		
SSB (10^3 t)	2	197	48	2			248	

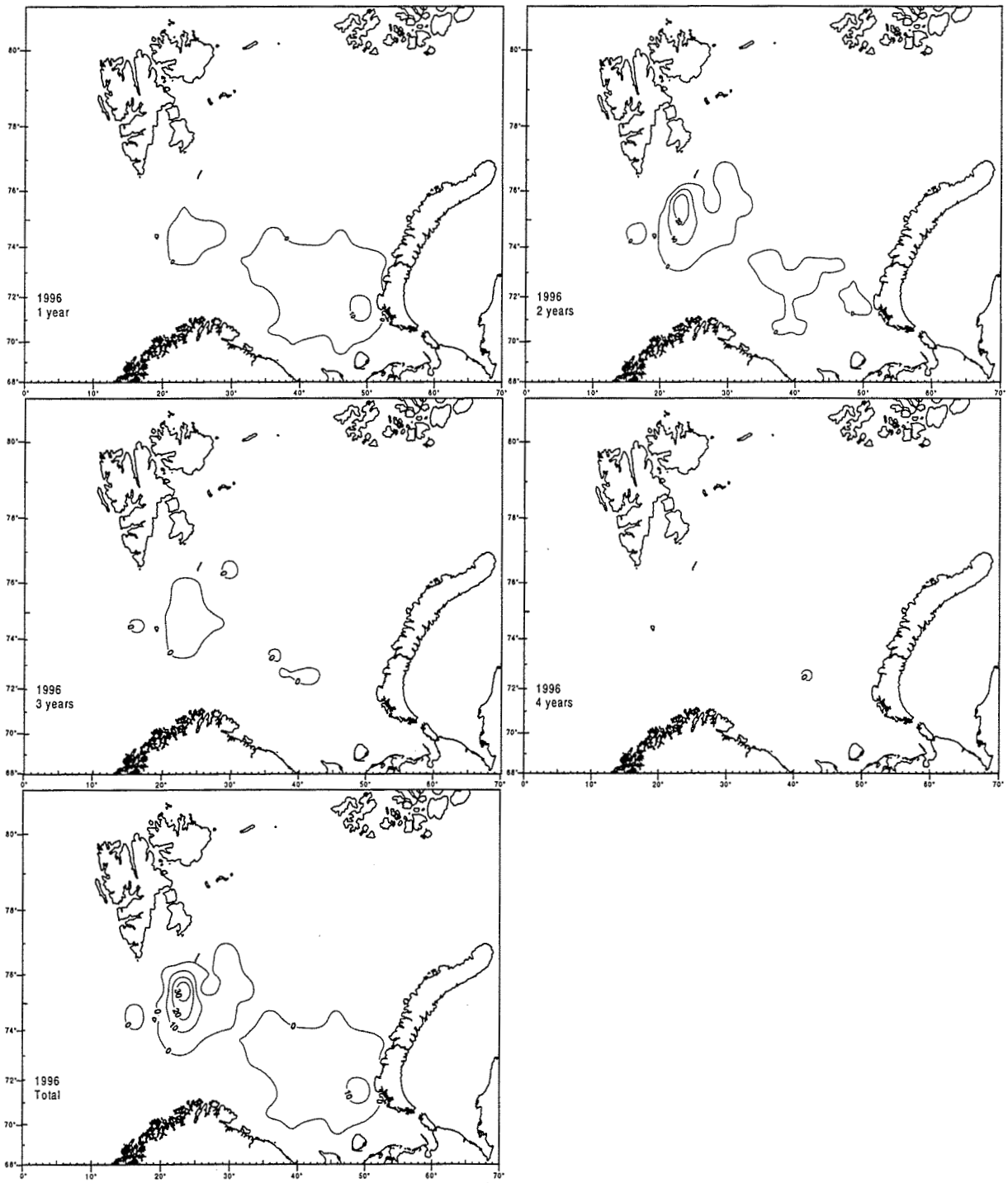

Figure 25. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1996.

Table 27. Acoustic abundance estimate of Barents Sea capelin in autumn 1997, based on *TS* = 19.1 *log L -74.0.* TSN and SSN are the number of individuals in the total stock and the spawning stock (>14.0 cm) respectively, and TSB and SSB are the total stock biomass and the spawning stock biomass. Mean length and mean weight pertains to the total stock.

Length (cm)	Age/Year class 1	2	3	4	5+	Sum	Biomass	Mean
	1995	1994	1993	1992	1991	(10^9)	(10^3 t)	weight (g)
5.5 - 6.0	0.02					0.02	0	1.0
6.0 - 6.5	0.11					0.11	0	1.0
6.5 - 7.0	0.69					0.69	1	1.0
7.0 - 7.5	3.93					3.93	4	1.1
7.5 - 8.0	5.24					5.24	8	1.6
8.0 - 8.5	6.41	0.43				6.84	13	1.9
8.5 - 9.0	6.72	0.34				7.06	16	2.2
9.0 - 9.5	7.62	0.49				8.12	23	2.8
9.5 - 10.0	10.77	2.00				12.77	43	3.3
10.0 - 10.5	12.57	1.20				13.77	55	4.0
10.5 - 11.0	14.53	1.23				15.76	75	4.8
11.0 - 11.5	12.10	1.78				13.89	77	5.5
11.5 - 12.0	10.46	1.83				12.29	79	6.5
12.0 - 12.5	4.70	3.22	0.02			7.95	59	7.5
12.5 - 13.0	2.02	4.52	0.02			6.56	56	8.6
13.0 - 13.5	0.69	4.30	0.10			5.09	50	9.7
13.5 - 14.0	0.24	3.17	0.03			3.45	39	11.2
14.0 - 14.5	0.04	2.66	0.11			2.80	37	13.2
14.5 - 15.0	0.02	2.73	0.07			2.83	42	14.9
15.0 - 15.5		2.79	0.24	0.02		3.05	51	16.6
15.5 - 16.0		1.93	0.05			1.97	37	18.7
16.0 - 16.5		1.74	0.05			1.79	39	22.0
16.5 - 17.0		1.32	0.26	0.06		1.64	39	23.6
17.0 - 17.5		0.77	0.32			1.09	28	25.9
17.5 - 18.0		0.53	0.30	0.02		0.85	25	29.1
18.0 - 18.5		0.10	0.24			0.34	11	32.2
18.5 - 19.0		0.02	0.07			0.09	3	35.4
19.0 - 19.5			0.02			0.02	1	36.0
TSN (10^9)	98.88	39.10	1.91	0.09	0.00	139.97		
TSB (10^3 t)	415	448	44	2	0		909	
Mean length (cm)	10.14	13.34	16.50	16.68		11.12		
Mean weight (g)	4.2	11.5	22.9	26.2				
SSN (10^9)	0.06	14.58	1.73	0.09		16.45		
SSB (10^3 t)	1	267	43	2	0		312	

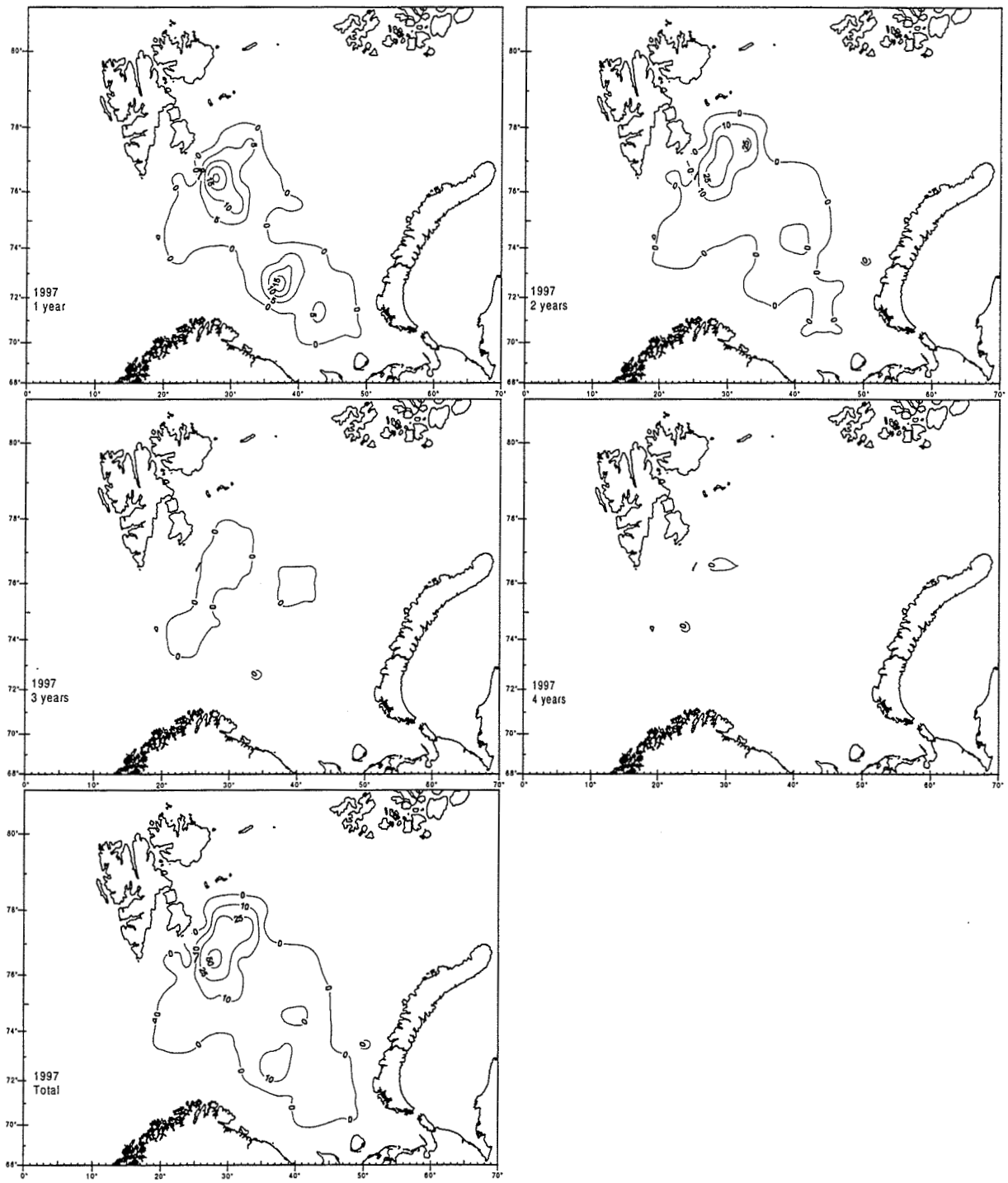

Figure 26. Density distribution (tonnes nautical mile^{-2}) of capelin aged 1, 2, 3 and four years, and total density distribution of capelin during autumn 1997.

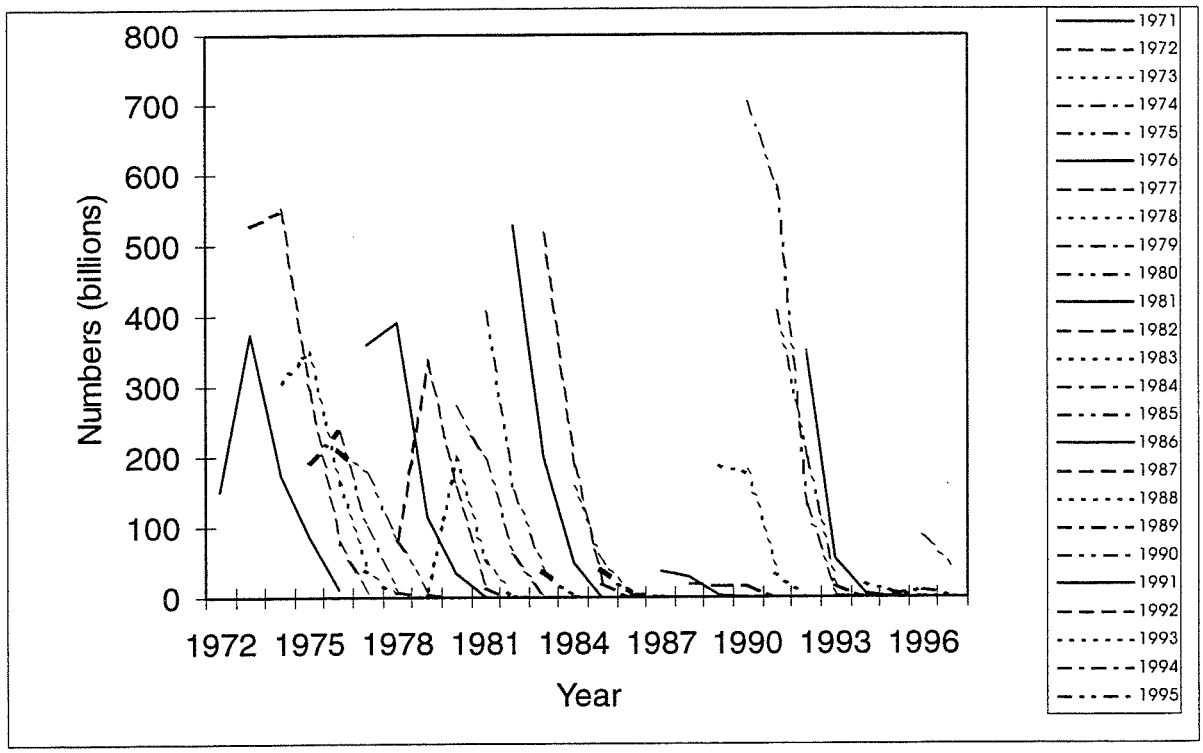

Figure 27. Number of individuals of capelin at age 1-5 in the year classes 1971-1995, estimated during annual acoustic surveys in autumn 1972-1997.

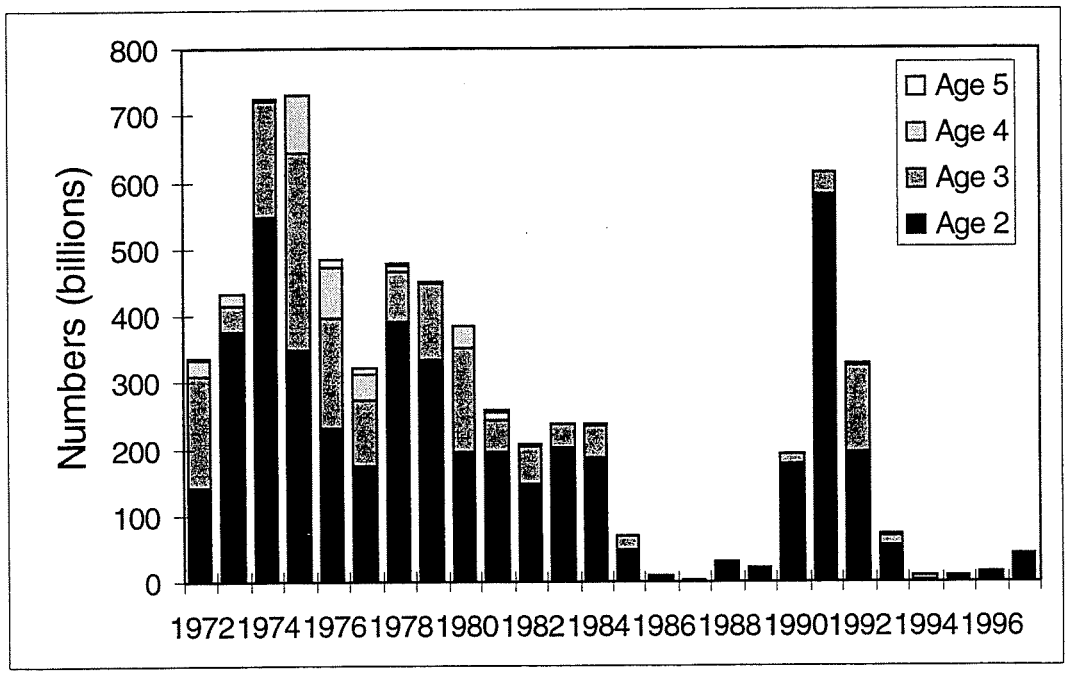

Figure 28. Abundance (number of individuals in billions) of capelin in age groups 2-5 estimated during annual acoustic surveys 1972-1997.

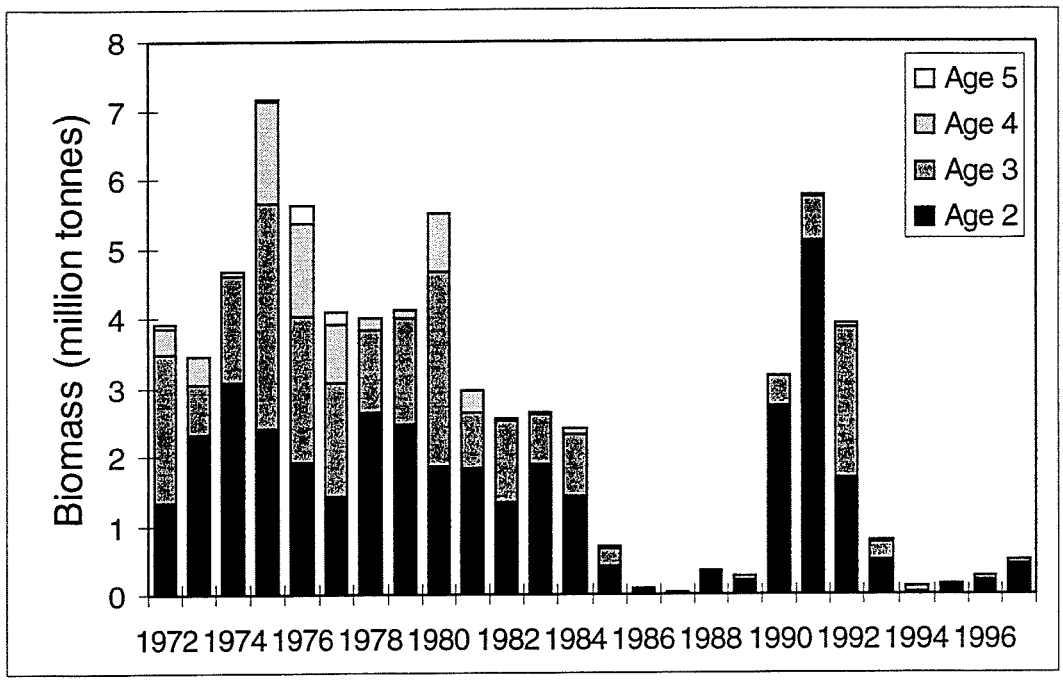

Figure 29. Abundance (biomass in thousand tonnes) of capelin in age groups 2-5 estimated during annual acoustic surveys 1972-1997.